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EPA Superfund
Record of Decision:

LIPARI LANDFILL
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1023.1 ET SEQ).

NUMEROUS INVESTIGATORS SUBSEQUENTLY COLLECTED SAMPLES OF THE CONTAMINATED GROUND WATER BENEATH THE LIPARI LANDFILL SITE. TTACHMENT A, LEACHATE CHARACTERISTICS OF LIPARI LANDFILL SAMPLES, SHOWS THE CONTAMINANTS AND MAXIMUM CONCENTRATIONS MEASURED IN SAMPLES OF GROUND WATER COLLECTED FROM WITHIN THE LANDFILL'S ENCAPSULATION SYSTEM UP TO 1985. THE DATA PROVIDED IN THE ATTACHMENT WERE USED IN THE DEVELOPMENT OF THE ON-SITE FEASIBILITY STUDY (CDM, 1985). TO DATE, A TOTAL OF 74 ORGANIC CONTAMINANTS AND 13 INORGANIC CONTAMINANTS HAVE BEEN FOUND IN THE GROUND WATER AND SOILS OF THE LANDFILL.

HISTORY OF OFF SITE AREAS

THE OFF-SITE AREAS HAVE BEEN THE SUBJECT OF INVESTIGATIONS BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA) AND OTHERS. THESE STUDIES HAVE DOCUMENTED SOURCES OF ENVIRONMENTAL DEGRATION. A DISCUSSION OF SUCH SOURCES IN ADDITION TO THE LIPARI LANDFILL IS PRESENTED BELOW. THIS SECTION IS THEN FOLLOWED BY A DETAILED DISCUSSION (PHASE III OFF-SITE REMEDIAL INVESTIGATION) OF THE IMPACTS OF THE LIPARI LANDFILL ON GROUND WATER, SURFACE WATER, SOILS, SEDIMENT AND AIR IN THE VICINITY OF THE SITE.

IN THE MID-1950S, PRIOR TO OPERATION OF THE LIPARI LANDFILL, ALCYON LAKE BEGAN TO SHOW PHYSICAL SIGNS OF AN EXISTING PUBLIC HEALTH PROBLEM AND A DETERIORATING BIOTIC ENVIRONMENT. THE GLOUCESTER COUNTY PLANNING DEPARTMENT (GCPD, 1980) CITED FOUR PRIMARY REASONS FOR THE DETERIORATION OF ALCYON LAKE DURING ITS EARLY HISTORY.

AN INCREASING NUMBER OF SEPTIC TANK SYSTEMS WERE INSTALLED WITHIN THE LAKE'S DRAINAGE AREA.

INCREASED URBAN DEVELOPMENT AND ASSOCIATED INCREASES IN STORM WATER URBAN RUNOFF DISCHARGES INTO ALCYON LAKE AND TRIBUTARY STREAMS BY WAY OF DIRECT DRAINAGE INLETS.

MARGINALLY EFFECTIVE SEWERAGE COLLECTION AND TREATMENT FACILITIES IN THE BOROUGHS OF PITMAN AND GLASSBORO INCREASINGLY CONTRIBUTED FECAL MATTER AND BACTERIA INTO ALCYON LAKE.

SEDIMENTATION RESULTING FROM URBAN AND AGRICULTURAL DEVELOPMENT ACTIVITIES SEALED THE NATURAL SPRINGS IN THE BOTTOM OF THE LAKE DECREASING THE TURNOVER RATE OF FRESH WATER.

STORM SEWER OUTFALLS THAT DISCHARGE DIRECTLY INTO ALCYON LAKE AND ITS TRIBUTARIES HAVE CONTRIBUTED TO THE OBSERVED DETERIORATION OF THE LAKE. THE INCORPORATION OF THE BOROUGH OF PITMAN'S SEWAGE FLOW INTO THE GLOUCESTER COUNTY UTILITIES AUTHORITY (GCUA) WASTEWATER TREATMENT PLANT IN THE 1970S AND SUBSEQUENT CONSTRUCTION OF THE GLOUCESTER COUNTY SANITARY SEWER TRUNKLINE EAST OF CHESTNUT BRANCH HAS HELPED TO ALLEVIATE POLLUTION FROM SEPTIC TANKS. HOWEVER, THE EXTENT OF THE PRESENT PROBLEM ATTRIBUTABLE TO THE ABANDONED SEPTIC TANKS IS UNKNOWN. THE REMEDIAL INVESTIGATION FINDINGS SUPPORTED PREVIOUS FINDINGS INDICATING THAT WATER QUALITY IN ALCYON LAKE HAS DETERIORATED, IN PART, DUE TO BACTERIAL INPUT. CURRENT BACTERIAL CONCENTRATIONS IN THE LAKE EXCEED WATER QUALITY STANDARDS.

THE EXISTING BACTERIAL CONTAMINATION LED GLOUCESTER COUNTY TO CLOSE ALCYON LAKE TO SWIMMING IN 1958.

THE FIRST DOCUMENTED POINT SOURCE OF POLLUTION TO ALCYON LAKE WAS DUE TO THE BOROUGH OF GLASSBORO SEWERAGE TREATMENT PLANT. A SERIES OF MALFUNCTIONS BETWEEN 1958 AND 1972 CAUSED THE DISCHARGE OF RAW EFFLUENT THAT FLOWED DOWN CHESTNUT BRANCH AND INTO ALCYON LAKE. THE GLOUCESTER COUNTY SEWERAGE AUTHORITY (NOW KNOWN AS THE GLOUCESTER COUNTY UTILITIES AUTHORITY) INCORPORATED THE GLASSBORO SYSTEM IN 1972 AND EFFECTIVELY ELIMINATED THESE DISCHARGES (GCPD, 1980). THE BOROUGH OF PITMAN SEWERAGE SYSTEM LIFT STATION ALSO EXPERIENCED MECHANICAL MALFUNCTIONS AND STORM-RELATED OVERLOADINGS, CAUSING THE FACILITY TO ACTIVATE THE OVERFLOW MECHANISM AND DISCHARGE RAW EFFLUENT DIRECTLY INTO ALCYON LAKE. THESE PROBLEMS WERE CORRECTED BY THE BOROUGH OF PITMAN IN 1977, ALTHOUGH 50-YEAR STORM EVENTS HAVE OCCASIONALLY RESULTED IN INCIDENTAL OVERFLOW FROM THE LIFT STATION (GCPD, 1980). FURTHER LAND DEVELOPMENT IN THE AREA BROUGHT ADDITIONAL SOURCES OF DEGRADATION.

IN 1980, GLOUCESTER COUNTY IDENTIFIED THREE MAJOR SOURCES OF POLLUTANTS CONTRIBUTING TO THE WATER QUALITY DETERIORATION OF ALCYON LAKE: URBAN STORM WATER RUNOFF, AGRICULTURAL RUNOFF, AND THE LIPARI LANDFILL. THE COUNTY RECOGNIZED THAT INCREASED DEVELOPMENT INCREASED THE POLLUTANT BURDEN OF STORM WATER RUNOFF. STORM

WATER RUNOFF IS A SIGNIFICANT SOURCE OF POLLUTANTS, INCLUDING OIL AND GREASE, HYDROCARBONS, TRACE HEAVY METALS, AND MICRO-ORGANISMS. STORM WATER RUNOFF FROM SEVERAL HUNDRED ACRES OF THE BOROUGHS OF PITMAN AND GLASSBORO, INCLUDING COLLEGETOWN SHOPPING PLAZA AND GLASSBORO STATE COLLEGE, CONTINUES TO DISCHARGE DIRECTLY INTO ALCYON LAKE AND ITS TRIBUTARIES THROUGH SEVERAL DRAINAGE PIPES.

THE 1980 GLOUCESTER COUNTY REPORT ALSO SUGGESTS THAT ADVERSE WATER QUALITY IMPACTS ON ALCYON LAKE WERE FURTHER CAUSED BY THE CONTINUED DISCHARGE OF AGRICULTURAL RUNOFF FROM APPROXIMATELY 1,000 ACRES OF ACTIVE AGRICULTURAL LAND TREATED WITH PESTICIDES HERBICIDES, AND FUNGICIDES. HOWEVER, SPECIFIC STUDIES TO IDENTIFY THE MASS LOADING OF SPECIFIC CONTAMINANTS HAVE NOT BEEN UNDERTAKEN. CONSEQUENTLY, THE OVERALL CONTRIBUTION AND SIGNIFICANCE OF THESE CONTAMINANTS CANNOT BE QUANTIFIED.

HISTORY OF INVESTIGATIONS

VARIOUS STATE, LOCAL, AND MUNICIPAL INVESTIGATIONS AND STUDIES HAVE TAKEN PLACE OVER THE YEARS, SOME OF WHICH HAVE PROVED VALUABLE IN PROVIDING BACKGROUND INFORMATION. THE INVESTIGATIONS PERFORMED PRIOR TO THE STUDIES TO DETERMINE THE EXTENT AND NATURE OF THE CONTAMINATION IN THE LIPARI LANDFILL OFF-SITE AREAS ARE SUMMARIZED IN TABLE 1, HISTORY OF INVESTIGATIONS. A DETAILED DISCUSSION ON THESE INVESTIGATIONS IS GIVEN IN THE OFF-SITE LIPARI LANDFILL REMEDIAL INVESTIGATION (PHASE 1) REPORT (CDM, 1987).

HISTORY OF REMEDIAL ACTIONS

REMEDIAL ACTIONS HAVE TAKEN PLACE BOTH ON-SITE AT THE LIPARI LANDFILL, AS WELL AS OFF-SITE IN THE IMMEDIATE VICINITY OF THE LANDFILL. ON-SITE ACTIONS INVOLVED THE CONSTRUCTION OF THE CONTAINMENT SYSTEM AS PREVIOUSLY DESCRIBED. OFF-SITE ACTIONS HAVE INCLUDED TEMPORARY MEASURES, SUCH AS FENCE INSTALLATION AND POSTED SIGNS TO RESTRICT PUBLIC ACCESS TO THE MARSH AND ALCYON LAKE. A SUMMARY OF THE REMEDIAL HISTORY IS GIVEN IN TABLE 2, CHRONOLOGICAL SUMMARY OF DISPOSAL AND REMEDIATION HISTORY. A DISCUSSION OF THE HISTORY IS PRESENTED BELOW.

PUBLIC ACCESS RESTRICTED

PREVIOUS AND ONGOING INVESTIGATIONS CONFIRMED THAT THERE WAS A POTENTIAL RISK TO THE PUBLIC HEALTH AND ENVIRONMENT ASSOCIATED WITH THE LIPARI LANDFILL. ACTION WAS TAKEN UNDER THE AUTHORITY OF SECTION 104(C) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT. IN JULY 1982, AN 8-FOOT HIGH, CHAIN-LINK-PLUS-BARBED-WIRE FENCE WAS CONSTRUCTED AROUND THE MAIN LANDFILL SITE TO RESTRICT PUBLIC ACCESS. IN AUGUST 1983, A SECOND CHAIN LINK FENCE WAS INSTALLED ALONG CHESTNUT BRANCH BETWEEN THE HOUSES ON HOWARD AVENUE AND THE AREA EAST OF CHESTNUT BRANCH TO RESTRICT PUBLIC ACCESS TO THE MARSH AREA.

PHASE I REMEDIAL INVESTIGATIONS

R.E. WRIGHT (1981) EVALUATED SEVERAL REMEDIAL ALTERNATIVES INTENDED AS INTERIM ACTION UNTIL A COMPREHENSIVE LONG-TERM SOLUTION COULD BE DEVELOPED. RADIAN CORPORATION (1982), AT THE REQUEST OF EPA REGION II, REVIEWED THE ENVIRONMENTAL IMPACTS ASSOCIATED WITH NINE PROPOSED PHASE I REMEDIAL ACTION ALTERNATIVES FOR THE ON-SITE PORTION OF THE LIPARI LANDFILL STUDY AREA. THE PREFERRED ALTERNATIVE CONSISTED OF A FULLY ENCOMPASSING 360-DEGREE SLURRY WALL WITH AN IMPERVIOUS CAP OVER A 16-ACRE AREA, WITH FINAL TREATMENT OF THE CONTAMINATED GROUND WATER WITHIN THE ENCAPSULATION SYSTEM AT A PUBICLY OWNED TREATMENT PLANT. EPA APPROVED THIS PREFERRED ALTERNATIVE FOR THE ON-SITE LIPARI LANDFILL IN A RECORD OF DECISION (ROD), SIGNED ON AUGUST 3, 1982, AND COMMENCED CONSTRUCTION IN THE FALL OF 1983. THIS REMEDIAL MEASURE, PRESENTLY REFERRED TO AS PHASE I, WAS DESIGNED TO DIMINISH THE FLOW OF LEACHATE AND CONTAMINATED GROUND WATER FROM THE LANDFILL. AN ESTIMATED REDUCTION OF 95 PERCENT IN THE RATE OF GROUND WATER FLOW HAS BEEN ACHIEVED AS A RESULT OF THE INSTALLATION OF THE CONTAINMENT SYSTEM.

PHASE II ON SITE REMEDIATION

THE FINAL DRAFT REMEDIAL INVESTIGATION AND FEASIBILITY (RI/FS) FOR THE ON-SITE LIPARI LANDFILL BECAME THE BASIS FOR THE SELECTION OF A PERMANENT REMEDIAL ALTERNATIVE AS DISCUSSED IN THE EPA ROD, DATED SEPTEMBER 30, 1985. THE REMEDIAL ALTERNATIVE WHICH WAS SELECTED IS COMMONLY REFERRED TO AS THE "BATCH-FLUSHING" ALTERNATIVE. THE EFFECTIVENESS OF THE ON-SITE REMEDIAL ACTION TO BE IMPLEMENTED DIRECTLY AFFECTS THE LONG-TERM SUCCESS OF ANY REMEDIAL ACTION TAKEN IN THE OFF-SITE AREAS. THE ON-SITE ACTION INVOLVES THE

INSTALLATION OF EXTRACTION AND INJECTION WELLS WITHIN THE ENCAPSULATION SYSTEM TO DEWATER AND FLUSH WATER-BORNE CONTAMINANTS FOR TREATMENT AT AN ON-SITE FACILITY. A FORMAL AGREEMENT TO DISCHARGE TO THE GCUA TREATMENT FACILITY FOR FINAL TREATMENT IS UNDER NEGOTIATION. A REMEDIAL DESIGN STUDY IS CURRENTLY BEING PERFORMED TO DETERMINE THE DESIGN PARAMETERS, PARTICULARLY THOSE THAT WILL ALLOW THE BATCH-FLUSHING EFFORT TO BE COMPLETED WITHIN THE DESIRED TIME FRAME AND TO MEET GCUA PRETREATMENT STANDARDS. WHILE THERE IS THE POTENTIAL FOR CONTAMINANTS TO SEEP THROUGH THE SLURRY WALL DURING FLUSHING, THE SEPTEMBER 30, 1985 ROD SPECIFIED THAT THIS PROBLEM WOULD BE MITIGATED BY THE OFF-SITE REMEDIAL ACTION (SUCH AS AN OFF-SITE COLLECTION SYSTEM) DEVELOPED UNDER THE OFF-SITE RI/FS AND THAT IMPLEMENTATION OF THE BATCH-FLUSHING ALTERNATIVE WOULD NOT BEGIN UNTIL SUCH AN OFF-SITE COLLECTION SYSTEM WAS IN PLACE. THE REMEDIAL ACTIONS BEING SELECTED AT THIS TIME INCLUDE AN OFF-SITE COLLECTION SYSTEM AS IDENTIFIED IN THE 1985 ROD.
PHASE III OFF SITE REMEDIAL INVESTIGATION

IN ACCORDANCE WITH THE NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN (NCP), EPA CONDUCTED A REMEDIAL INVESTIGATION AND FEASIBILITY STUDY FOR THE "OFF-SITE" AREAS AFFECTED BY CONTAMINANT MIGRATION FROM THE LIPARI LANDFILL SITE. FIELD WORK FOR THE RI BEGAN IN FEBRUARY 1985 AND WAS COMPLETED IN FEBRUARY 1987. CONTAMINANTS FOUND IN THE GROUND WATER, SURFACE WATER, SOILS, LAKE AND STREAM SEDIMENTS, AND IN THE AIR IN THE OFF-SITE LIPARI AREAS ARE LISTED IN ATTACHMENT B, WHICH INCLUDES DATA FROM THE SAMPLING PERFORMED BY EPA'S FIELD INVESTIGATION TEAM (FIT) AND ENVIRONMENTAL RESPONSE TEAM (ERT).

THE OFF-SITE RI REPORT DOCUMENTS THE PRESENCE OF ORGANIC AND INORGANIC CONTAMINANTS ATTRIBUTABLE TO THE LIPARI LANDFILL IN THE FOLLOWING OFF-SITE AREAS:

GROUND WATER IN THE COHANSEY AND KIRKWOOD AQUIFERS;

SOILS IN THE CHESTNUT BRANCH MARSH;

LEACHATE SEEPS IN THE CHESTNUT BRANCH MARSH;

AIR IN THE VICINITY THE CHESTNUT BRANCH MARSH ABOVE THE LEACHATE SEEPS AND IN NEARBY RESIDENTIAL AREAS;

SURFACE WATER AND SEDIMENTS OF CHESTNUT BRANCH STREAM;

SURFACE WATER AND SEDIMENTS OF RABBIT RUN; AND

SURFACE WATER AND SEDIMENTS OF ALCYON LAKE.

CONTAMINATION ATTRIBUTABLE TO THE LIPARI LANDFILL IN THE OFF-SITE AREAS IS DUE TO MIGRATION THROUGH ALL MEDIA: SOIL, WATER AND AIR. A TOTAL OF 63 OF THE 74 ORGANIC CONTAMINANTS, AND ALL 13 OF THE INORGANIC CONTAMINANTS DETECTED ON-SITE HAVE BEEN DETECTED IN THE OFF-SITE AREAS. DUE TO THE LARGE NUMBER OF LIPARI-ASSOCIATED CONTAMINANTS IN THE OFF-SITE AREAS, 13 INDICATOR CHEMICALS WERE SELECTED FOR DETAILED REVIEW DURING THE REMEDIAL INVESTIGATION TO EVALUATE CONTAMINANT MIGRATION FROM THE LIPARI LANDFILL. TABLE 3 COMPARES CONCENTRATIONS OF THE INDICATOR CHEMICALS FOUND IN THE OFF-SITE SOILS, SEDIMENTS AND SURFACE WATERS IN AREAS IMPACTED BY CONTAMINANT MIGRATION FROM THE SITE, TO BACKGROUND AREAS NOT IMPACTED BY THE SITE. THIS TABLE DEMONSTRATES THAT ELEVATED LEVELS OF INDICATOR CHEMICALS EXIST IN THE SOILS OF CHESTNUT BRANCH MARSH, THE SEDIMENTS AND SURFACE WATERS OF RABBIT RUN, CHESTNUT BRANCH STREAM, AND ALCYON LAKE. IN ADDITION, LIPARI-RELATED CONTAMINANTS INCLUDING BIS(2-CHLOROETHYL)ETHER, 1,2-DICHLOROETHANE, AND BENZENE HAVE BEEN DETECTED DURING RESIDENTIAL AIR MONITORING PERFORMED WITH EPA'S TRACE ATMOSPHERIC GAS ANALYZER (TAGA) UNIT.

A LISTING OF REPRESENTATIVE LIPARI-RELATED CONTAMINANTS FOUND IN THE COHANSEY AND KIRKWOOD AQUIFERS, THE LEACHATE SEEPS IN CHESTNUT BRANCH MARSH, AND IN THE AMBIENT AIR ABOVE THE MARSH AND IN RESIDENTIAL AREAS SINCE THE CONSTRUCTION OF THE ON-SITE CONTAINMENT SYSTEM, IS SHOWN IN TABLE 4. ATTACHMENTS A AND B CONTAIN MORE COMPLETE LISTINGS OF ON-SITE AND OFF-SITE SAMPLING RESULTS. ATTACHMENT C PRESENTS A QUALITATIVE ANALYSIS OF THE PRESENCE OF LIPARI-RELATED CONTAMINANTS IN ALL OF THE ON-SITE AND OFF-SITE MEDIA.

MORE RECENT SAMPLING UTILIZING LOWER DETECTION LIMITS THAN WERE AVAILABLE DURING THE RI HAS SHOWN THE PRESENCE OF BIS (2-CHLOROETHYL)ETHER IN THE SEDIMENTS OF CHESTNUT BRANCH STREAM (41 TO 47 MILLIGRAMS PER KILLIGRAM (UG/KG)), AND IN THE SEDIMENTS OF ALCYON LAKE (42 TO 400 UG/KG). THIS SAMPLING WAS UNDERTAKEN BY

EPA'S ENVIRONMENTAL RESPONSE TEAM (EPA/ERT), TO ADDRESS CONCERNS RAISED BY THE U.S. DEPARTMENT OF THE INTERIOR'S FISH AND WILDLIFE SERVICE INVOLVING THE PRESENCE OF LIPARI RELATED CONTAMINANTS IN AQUATIC HABITATS FOR WHICH IT IS THE NATURAL RESOURCE TRUSTEE. THE CONCERNS WERE RELATED TO HIGH DETECTION LIMITS ASSOCIATED WITH SEDIMENT SAMPLING DURING THE OFF-STE RI FIELD ACTIVITIES, ESPECIALLY WITH REGARD TO BCEE AND MERCURY. IT IS NOTABLE THAT, DURING THE OFF-SITE RI SAMPLING WHEN LOWER DETECTION LIMITS WERE ACHIEVED (RABBIT RUN SE-08), BCEE WAS DETECTED IN THE SEDIMENTS. THE DETECTION OF THE PRESENCE OF BCEE IN THE SEDIMENTS OF ALCYON LAKE AND CHESTNUT BRANCH BY EPA/ERT HAS PROVIDED NATURAL RESOURCE TRUSTEES WITH ADDITIONAL INFORMATION TO ASSESS THE IMPACTS TO HABITATS UNDER THEIR RESPONSIBILITY. IT HAS ALSO FURTHER DEMONSTRATED THE PRESENCE OF LIPARI CONTAMINANTS IN THE OFF-SITE ENVIRONMENT. A 21-DAY COMMENT PERIOD WAS ANNOUNCED TO RECEIVE COMMENTS FROM INTERESTED PARTIES ON THE EPA/ERT SAMPLING EFFORT. NO COMMENTS WERE RECEIVED DURING THAT PERIOD, HOWEVER, COMMENTS REGARDING THE SAMPLING PROCEDURES AND THE REASONS FOR THE SAMPLING EVENT WERE RECEIVED THE FOLLOWING WEEK. A REPLY WAS PROVIDED TO THESE COMMENTS.

THE COHANSEY AQUIFER TO THE EAST AND NORTHEAST OF THE LANDFILL IN THE CHESTNUT BRANCH MARSH IS DIRECTLY IN THE PATH OF LOCAL AND REGIONAL GROUND WATER FLOW. IT IS LIKELY THAT THE PRESENCE OF CONTAMINANTS IN THIS AQUIFER IS LARGELY ATTRIBUTABLE TO SEEPAGE PRIOR TO CONSTRUCTION OF THE CONTAINMENT SYSTEM. A PORTION OF THIS FORMATION IN THE MARSH WAS NOT ENCAPSULATED BECAUSE OF THE LIMITS OF SLURRY WALL CONSTRUCTION RELATIVE TO LOCAL GEOLOGY, GEOGRAPHY AND WATER CONDITIONS. AS A RESULT, A RESERVOIR OF CONTAMINANTS PERSISTS IN THE GROUND WATER AND SOILS OF CHESTNUT BRANCH MARSH. THE LEACHATE SEEP AREAS SHOW SEASONAL VARIATION CORRESPONDING TO FLUCTUATIONS IN THE WATER TABLE OF THE COHANSEY AQUIFER. THIS SEASONAL ACTIVITY LEADS TO INTERMITTENT PERIODS OF LEACHATE FLOW INTO CHESTNUT BRANCH STREAM. THE VARIABILITY IN LEACHATE FLOW, COUPLED WITH VARIATIONS IN METEOROLOGICAL CONDITIONS (TEMPERATURE, WIND, RAIN FALL, SOLAR RADIATION, ATMOSPHERIC INVERSIONS), AFFECT THE RATE OF HAZARDOUS ORGANIC AIR-BORNE EMISSIONS FROM THE CHESTNUT BRANCH MARSH. THE AREA REFERED TO AS "ZONE 3" (FIGURE 3) IS CHARACTERIZED AS THE AREA OF HIGHEST AIR-BORNE EMISSIONS. ZONE 3 ALSO ENCOMPASSES THE PORTIONS OF THE MARSH CONTAINING THE MAJORITY OF THE LEACHATE SEEPS. A COMPLETE LISTING OF COMPOUNDS DETECTED IN THE SOILS OF CHESTNUT BRANCH MARSH, THE LEACHATE SEEPS, AND IN THE AIR ABOVE THE SEEPS, IS SHOWN IN ATTACHMENT B.

THE KIRKWOOD AQUIFER UNDERLIES THE KIRKWOOD CLAY, A CONFINING UNIT THAT SEPARATES IT FROM THE SURFICIAL COHANSEY AQUIFER. THE KIRKWOOD IS CHARACTERIZED AS A LOW-YIELD FORMATION CONTAINING FINE TO VERY FINE DARK GREY SILTY MICACEOUS SAND. THE CONTAMINATION THAT IS PRESENT IN THE KIRKWOOD MAY BE DUE TO IMPROPERLY SEALED WELLS PLACED IN THE LANDFILL DURING THE LATE 1970S THAT ACTED AS A CONDUIT FOR CONTAMINANT MIGRATION, OR FROM VERTICAL MIGRATION FROM CONTAMINANTS PRESENT IN THE OVERLYING COHANSEY FORMATION THROUGH THE KIRKWOOD CLAY. THE KIRKWOOD CLAY IS A CONTINUOU FORMATION UNDER THE SITE WHICH RANGES IN THICKNESS FROM 9 TO 16 FEET. IN THE AREA OF THE CHESTNUT BRANCH MARSH ADJACENT TO THE SITE, THE CHESTNUT BRANCH STREAM HAS ERODED THE COHANSEY SANDS AND THE UPPER PORTIONS OF THE KIRKWOOD CLAY. ALLUVIAL MATERIAL DEPOSITED BY THE STREAM IS HYDRAULICALLY CONNECTED WITH THE COHANSEY SANDS, AND THE KIRKWOOD SANDS. THE KIRKWOOD CLAY THINS OUT BECAUSE OF EROSION ALONG THE SOUTH-TO-NORTH MEANDER OF THE STREAM. NEAR THE CONFLUENCE OF RABBIT RUN AND CHESTNUT BRANCH, THE KIRKWOOD CLAY APPEARS TO BE COMPLETELY ERODED. GEOLOGIC PROFILES OF THE LOCAL AREA ARE CONTAINED IN ATTACHMENT D.

#CPR
CONTAMINANTS PATHWAYS/RISKS

DUE TO LOCAL ENVIRONMENTAL CONDITIONS, INCLUDING GEOGRAPHY, GEOLOGY, HYDROLOGY AND METEOROLOGY, AND THE RESULTS OF OFF-SITE STUDIES, EPA HAS CONCLUDED THAT SEVERAL CONTAMINANT MIGRATION PATHWAYS EXIST FROM THE LIPARI LANDFILL TO VARIOUS OFF-SITE AREAS.

THE DETECTION OF INDICATOR CHEMICALS IN THE SURFACE WATERS AND SEDIMENTS OF RABBIT RUN, CHESTNUT BRANCH STREAM, AND ALCYON LAKE INDICATES THAT OVERLAND TRANSPORT OF INDICATOR CHEMICALS FROM THE MARSH HAS OCCURRED. EROSION AND/OR LEACHING OF MARSH SOILS, FOLLOWED BY SURFACE WATER TRANSPORT IS A LIKELY MIGRATION PATH-WAY. DIRECT FLOW OF CONTAMINATED SEEPAGE FROM THE BANK ADJACENT TO THE LANDFILL, FOLLOWED BY FLOW ACROSS THE GROUND SURFACE TO CHESTNUT BRANCH STREAM HAS BEEN OBSERVED. RAINSTORMS AND FLOODING COULD ACCELERATE BOTH PROCESSES. CONTAMINANTS CAN ALSO LEACH VERTICALLY AND REACH THE GROUND WATER. ANALYSIS OF ORGANIC CHEMICAL VOLATILIZATION FROM MARSH SOILS, LEACHATE SEEPS, AND AMBIENT AIR DEMONSTRATES THAT AIR TRANSPORT OF ORGANIC CONTAMINANTS IS ANOTHER CONTAMINANT MIGRATION PATHWAY.

THE PRESENCE OF INDICATOR CHEMICALS IN THE DOWNGRADIENT GROUND WATER OF THE COHANSEY AND KIRKWOOD AQUIFERS INDICATES HORIZONTAL MIGRATION OF CONTAMINANTS IN THE GROUND WATER. THE PRESENCE OF A HYDRAULIC GRADIENT TOWARDS CHESTNUT BRANCH STREAM ON EITHER SIDE OF THE STREAM INDICATES THAT THE POTENTIAL FOR CONTAMINANT MIGRATION BEYOND THE STREAM IS UNLIKELY. THE COHANSEY AND KIRKWOOD AQUIFERS BOTH DISCHARGE INTO CHESTNUT BRANCH STREAM AND CAN TRANSPORT CONTAMINANTS INTO THE STREAM.

RISKS

AS DESCRIBED IN THE OFF-SITE RI REPORT, 13 INDICATOR CHEMICALS WERE SELECTED IN ACCORDANCE WITH THE SUPERFUND PUBLIC HEALTH EVALUATION MANUAL ON THE BASIS OF TOXICITY, PERSISTENCE, MOBILITY AND CONCENTRATION. THE LIST OF INDICATOR CHEMICALS INCLUDE;BENZENE, BIS(2-CHLOROETHYL)ETHER, 1,2-DICHLOROETHANE, ETHYLBENZENE, 4-METHYL-2-PENTANONE, TOLUENE, XYLENES (TOTAL), ARSENIC, CHROMIUM, LEAD, MERCURY, NICKEL, AND ZINC.

FOR RISK ASSESSMENT PURPOSES, INDIVIDUAL CONTAMINANTS WERE SEPARATED INTO TWO CATEGORIES OF CHEMICAL TOXICITY DEPENDING ON WHETHER THEY CAUSE CARCINOGENIC OR NON-CARCINOGENIC EFFECTS. IN THE CASE OF CHEMICALS EXHIBITING CARCINOGENIC EFFECTS EXPOSURES AND ASSOCIATED RISKS ARE EXPRESSED IN AN EXPONENTIAL NOMENCLATURE; 1X10-4 (ONE IN TEN THOUSAND), 10X10-7 (ONE IN TEN MILLION) ETC. EPA HAS USED THE RANGE OF 1X10-4 TO 1X10-7 IN EVALUATING RISK ASSESSMENT DECISIONS. THE LEVEL OF 1X10-6, ONE IN A MILLION, HAS OFTEN BEEN USED BY REGULATORY AGENCIES AS A BENCHMARK.

THE PUBLIC HEALTH EVALUATION (PHE) CHARACTERIZED THE RISK ASSOCIATED WITH EXPOSURE TO OFF-SITE LIPARI LANDFILL INDICATOR CHEMICALS. A SUMMARY OF THE EXPOSURE PATHWAYS AND ASSOCIATED RISKS IS SHOWN IN TABLE 5. A LIFETIME EXCESS CANCER RISK GREATER THAN 1X10-6 (ONE IN A MILLION) WAS CHARACTERIZED FOR THE FOLLOWING EXPOSURE PATHWAYS;

DIRECT CONTACT WITH SOILS IN THE LEACHATE SEEP AREAS;

CONSUMPTION OF FISH FROM ALCYON LAKE; AND

INHALATION OF AMBIENT AIR IN THE HOWARD AVENUE RESIDENTIAL AREA.

THE PHE CONCLUDED THAT LONG-TERM EXPOSURE TO VOLATILE ORGANIC EMISSIONS ORIGINATING IN THE CHESTNUT BRANCH MARSH WOULD RESULT IN A POTENTIAL HUMAN HEALTH THREAT. INCREASED LIFETIME CANCER INCIDENCES ASSOCIATED WITH EXPOSURE TO BCEE, BENZENE, AND 1,2- DICHLOROETHANE WERE QUANTIFIED AND ARE PRESENTED IN TABLE 5. ALTHOUGH THESE COMPOUNDS WERE DETECTED DURING RESIDENTIAL AIR MONITORING WITH THE TAGA UNIT, THE AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) EVALUATION OF THE TAGA DATA CONCLUDED THAT THE LEVELS DETECTED DO NOT POSE A CURRENT HEALTH THREAT.

AS DESCRIBED IN THE RI REPORT, CONTAMINANT MIGRATION PERSISTS IN THE LEACHATE SEEPS THAT IN TURN MIGRATE INTO THE CHESTNUT BRANCH MARSH, AS WELL AS INTO THE AIR ABOVE THE MARSH AND NEARBY RESIDENTIAL AREAS, TO CHESTNUT BRANCH STREAM, AND TO DOWNSTREAM RECEIVING WATERS INCLUDING ALCYON LAKE. STUDIES HAVE SHOWN THAT THAT BIS(2-CHLOROETHYL)ETHER AND MERCURY ARE PRESENT IN THE TISSUE OF FISH FROM THE LAKE. THE LANDFILL AND THE MARSH AREAS ARE FENCED TO RESTRICT ACCESS. ALCYON LAKE IS CLOSED TO FISHING, SWIMMING, BOATING AND OTHER RECREATIONAL ACTIVTIES. THE LAKE AND STREAMS ARE NOT USED AS SOURCES OF POTABLE WATER.

THE PITMAN MUNICIPAL WELLS, AS WELL AS 11 NON-POTABLE RESIDENTIAL WELLS, HAVE BEEN SAMPLED FOR PRIORITY POLLUTANTS, AND MOST RECENTLY FOR TARGET COMPOUND LIST (TCL) CONTAMINANTS. THE WATER SAMPLES HAVE DEMONSTRATED THAT CONTAMINANTS FROM THE LIPARI LANDFILL HAVE NOT MIGRATED INTO ANY LOCAL WELLS. THESE INDINGS ARE CONSISTENT WITH LOCAL GEOLOGICAL AND HYDROGEOLOGICAL CONDITIONS WHICH INDICATE THAT CONTAMINATION IS LIMITED TO THE COHANSEY AND UPPER PORTIONS OF THE KIRKWOOD AQUIFER. FUTHERMORE, THE KIRKWOOD AQUIFER FLOWS UPWARDS INTO THE CHESTNUT BRANCH STREAM IN THE VICINITY OF THE LIPARI LANDFILL, WHILE THE COHANSEY DRAINS DIRECTLY INTO THE STREAM. THEREFORE, GROUND WATER CONTAMINANT MIGRATION IS INTERCEPTED AT THE STREAM. THIS FACTOR, COUPLED WITH THE DEPTH AND LOCATION OF THE RESIDENTIAL WELLS (MOUNT LAUREL, APPROXIMATELY 150 FEET DEEP) AND THE PITMAN MUNICIPAL WELLS (POTOMAC-RARITAN-MAGOTHY, APPROXIMATELY 550 FEET DEEP) AND THE PRESENCE OF SEVERAL CONFINING LAYERS MAKES THE POSSIBILITY OF THE INTRODUCTION OF LIPARI CONTAMINANTS TO EITHER WELL SYSTEM EXTREMELY REMOTE.

#EA
ENFORCEMENT ACTIVITIES

ON SEPTEMBER 10, 1985, THE UNITED STATES FILED A COMPLAINT IN THE DISTRICT COURT FOR THE DISTRICT OF NEW JERSEY AGAINST THE ROHM AND HAAS COMPANY, INC., MARVIN JONAS, INC., CBS RECORDS, INC., OWENS-ILLINOIS, INC., CENCO, INC., ALMO, INC., AND MANOR HEALTH CARE CORPORATION PURSUANT TO SECTION 107(A) OF CERCLA, 42 U.S.C. }9607 (A), SEEKING RECOVERY OF COSTS INCURRED AND TO BE INCURRED IN REMEDIATING THE LIPARI LANDFILL, AS WELL AS DECLARATORY RELIEF PURSUANT TO 2 U.S.C. }2201.

ON JANUARY 29, 1986, THE STATE OF NEW JERSEY FILED A COMPLAINT IN INTERVENTION IN THE SUIT SEEKING TO RECOVER STATE COSTS INCURRED AND TO BE INCURRED IN REMEDIATING THE SITE.

IN OCTOBER 1986, NEGOTIATIONS FOR A PARTIAL SETTLEMENT COMMENCED WITH THIRTEEN ADDITIONAL PARTIES CONSIDERED TO BE DEMINIMIS GENERATORS OF WASTE DISPOSED AT THE LIPARI LANDFILL. TEN OF THE ORIGINAL THIRTEEN DE MINIMIS PARTIES REMAIN AT THE CONCLUSION OF THE NEGOTIATION PROCESS.

#CRA
COMMUNITY RELATIONS ACTIVITIES

NUMEROUS COMMUNITY RELATIONS ACTIVITIES HAVE BEEN ON-GOING DURING THE COURSE OF THE OFF-SITE RI/FS FOR THE LIPARI SITE. A DETAILED 10-PAGE PROPOSED REMEDIAL ACTION PLAN (PRAP) (ATTACHMENT E) WAS DEVELOPED AND DISTRIBUTED TO OVER 300 INTERESTED CITIZENS AND POTENTIALLY RESPONSIBLE PARTIES. THE PRAP WAS DISTRIBUTED ON MARCH 1, 1988 ALONG WITH A NOTICE FOR A PUBLIC MEETING TO BE HELD ON MARCH 29, 1988. THE PUBLIC COMMENT PERIOD EXTENDED AN ADDITIONAL 17 DAYS BEYOND THE PUBLIC MEETING TO APRIL 15, 1988. AT THE REQUEST OF THE MAYOR OF THE BOROUGH OF PITMAN, EPA HELD A PUBLIC INFORMATION MEETING AT PITMAN BOROUGH HALL ON MARCH 15, 1988. AS DISCUSSED ON PAGE 9, A 21-DAY COMMENT PERIOD WAS HELD TO RECEIVE COMMENTS ON THE 1988 EPA/ERT OFF-SITE SAMPLING PROGRAM. WHILE NO COMMENTS WERE RECEIVED DURING THAT PERIOD, LATER COMMENTS WERE RECEIVED AND A REPLY WAS SENT.

THE COMMUNITY HAS BEEN ACTIVELY INVOLVED IN THE ISSUES RELATED TO THE LIPARI LANDFILL SITE FOR SEVERAL YEARS. THE BOROUGH WAS THE RECIPIENT OF A TECHNICAL ASSISTANCE GRANT (TAG) IN JANUARY 1987 AND HIRED A TECHNICAL CONSULTANT IN THE SUMMER OF 1987. THE TAG PROGRAM HAS FACILITATED COMMUNICATIONS BETWEEN EPA AND THE COMMUNITY. CONCERNED CITIZENS, LOCAL CITIZENS, ENVIRONMENTAL GROUPS AND ELECTED OFFICIALS HAVE ALL EXPRESSED THE SENTIMENT THAT THEY HAVE FELT INVOLVED IN THE DECISION MAKING PROCESS FOR OFF-SITE REMEDIATION.

#SRRA
SCOPE AND ROLE OF REMEDIAL ACTIONS

THE OVERALL REMEDIATION OF THREATS TO PUBLIC HEALTH AND THE ENVIRONMENT POSED BY THE LIPARI LANDFILL HAS BEEN UNDERTAKEN BY EPA IN A THREE-PHASED APPROACH. AS DISCUSSED PREVIOUSLY, THE AUGUST 3, 1982 ROD (PHASE I) SELECTED A 360 DEGREE SURRY WALL AND IMPERMEABLE CAP TO RESTRICT CONTAMINANT MIGRATIO FROM THE SITE. THIS ACTION PROVIDED SUBSTANTIAL RELIEF FROM NOXIOUS VOLATILE EMISSIONS AND THE MIGRATION OF CONTAMINANTS INTO THE MARSH AREA, NEARBY STREAMS AND ALCYON LAKE. THE SEPTEMBER 30, 1985 ROD (PHASE II) ADDRESSED THE PERMANENT REMOVAL OF CONTAMINANTS FROM WITHIN THE CONTAINMENT SYSTEM THROUGH BATCH-FLUSHING AND ON-SITE TREATMENT OF THE FLUSHWATER. IN ADDITION, THAT ROD CALLED FOR THE COLLECTION OF LEACHATE OUTSIDE OF THE CONTAINMENT SYSTEM.

THIS ROD ADDRESSES PHASE III, OR THOSE AREAS OUTSIDE OF THE CONTAINMENT SYSTEM WHERE LIPARI-RELATED CONTAMINANTS PERSIST IN THE ENVIRONMENT. THE PRINCIPAL THREATS ASSOCIATED WITH THESE CONTAMINANTS IN THE OFF-SITE AREAS INCLUDE POTENTIAL HUMAN HEALTH THREATS FROM LONG-TERM EXPOSURE TO CONTAMINANTS, AND CONTAMINANTS THAT ARE PRESENT IN QUANTITIES THAT EXCEED ENVIRONMENTAL STANDARDS AND GUIDELINES. THESE ARE ILLUSTRATED IN TABLE 5, RISK ASSESSMENT AND IN TABLE 6, CHEMICAL SPECIFIC ARARS.

REMEDIAL ACTIONS TO REMOVE PERSISTENT CONTAMINANTS FROM CHESTNUT BRANCH MARSH, RABBIT RUN, CHESTNUT BRANCH STREAM, AND ALCYON LAKE WILL ELIMINATE THESE THREATS. THE INSTALLATION OF A COLLECION SYSTEM IN THE MARSH OUTSIDE OF THE SLURRY WALL WIL ENSURE THAT NO EXISTING CONTAMINANTS OR POTENTIAL FUTURE CONTAMINANT MIGRATION DURING ON-SITE FLUSHING IMPACTS THE OFF-SITE AREAS.

SIMILARLY, THE ACTIVE PUMPING AND TREATMENT OF CONTAMINANTS FROM THE KIRKWOOD AQUIFER WIIL REMOVE EXISTING CONTAMINANTS, AND ANY POTENTIAL FUTURE CONTAMINANTS. THIS ACTION WILL RESTORE THE AQUIFER TO ENSURE THAT ENVIRONMENTAL STANDARDS ARE MET AT DISCHARGE POINTS OF THE KIRKWOOD GROUND WATER IN CHESTNUT BRANCH STREAM AND ALCYON LAKE. ACTIONS AIMED AT THE COLLECTION OF CONTAMINATED GROUND WATER/LEACHATE WILL MEET THE INTENT OF THE PHASE II ROD TO COORDINATE OFF-SITE REMEDIAL ACTIONS WITH ON-SITE REMEDIAL ACTIONS, "ESPECIALLY WITH REGARD TO LEACHATE TREATMENT".

IN SUMMARY, THE REMEDIAL ACTIONS SET FORTH IN THIS RECORD OF DECISION REPRESENT THE THIRD PHASE OF A COORDINATED EFFORT TO REMOVE CONTAMINANTS FROM THE ENVIRONMENT THAT ARE ASSOCIATED WITH THE LIPARI LANDFILL.

#DRA
DESCRIPTION OF REMEDIAL ALTERNATIVES

THIS SECTION DESCRIBES THE REMEDIAL ALTERNATIVES THAT WERE DEVELOPED, USING SUITABLE TECHNOLOGIES, TO MEET THE OBJECTIVES OF THE NCP. THESE ALTERNATIVES WERE DEVELOPED BY SCREENING A WIDE RANGE OF TECHNOLOGIES FOR THEIR APPLICABILITY TO SITE SPECIFIC CONDITIONS INCLUDING APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) AND EVALUATING THEM FOR EFFECTIVENESS, IMPLEMENTABILITY, AND COST.

ARARS

SECTION 121(D) OF CERCLA, AS AMENDED BY SARA, REQUIRES THAT REMEDIAL ACTIONS COMPLY WITH ALL APPLICABLE OR RELEVANT AND APPROPRIATE FEDERAL AND STATE REQUIREMENTS FOR THE HAZARDOUS SUBSTANCES, POLLUTANTS, OR CONTAMINANTS THAT ARE PRESENT AND ATTRIBUTABLE TO A SITE. IN GENERAL, ARARS ARE PROMULGATED TO ADDRESS CHEMICAL CONTAMINANTS, SPECIFIC LOCATIONS (SUCH AS A MARSH), OR ACTIONS (SUCH AS THERMAL DESORPTION). CHEMICAL SPECIFIC ARARS CAN BE APPLIED TO THE RI RESULTS BEFORE ANY REMEDIAL ALTERNATIVES ARE DEVELOPED, WHILE LOCATION AND ACTION SPECIFIC ARARS RELATE TO REMEDIAL ALTERNATIVES AND THEIR IMPLEMENTATION. AS DISCUSSED IN THE OFF-SITE RI AND FS, NUMEROUS CHEMICAL, LOCATION, AND ACTION-SPECIFIC ARARS WERE EVALUATED FOR THE OFF-SITE AREAS. THE CONTAMINATED SOILS AND SEDIMENTS IN THE OFF-SITE AREAS ARE IMPACTING THE QUALITY OF WATER IN CONTACT WITH THE SOILS OF CHESTNUT BRANCH MARSH, AND THE SEDIMENTS OF RABBIT RUN, CHESTNUT BRANCH STREAM AND ALCYON LAKE. AS SUCH, CLEANUP OF THESE AREAS IS NECESSARY TO ACHIEVE WATER QUALITY ARARS.

THE SAME RATIONALE APPLIES TO THE MARSH GROUND WATER COLLECTION SYSTEM. HOWEVER, NO FEDERAL OR STATE ARARS HAVE YET BEEN ESTABLISHED FOR SOILS AND SEDIMENTS. AS SUCH, THE GUIDELINES APPLIED TO THE SOIL AND SEDIMENTS INCLUDE THE FOLLOWING:

CLEANUP OBJECTIVES DEVELOPED BY THE NJDEP FOR SOILS UNDER THE ENVIRONMENTAL CLEANUP AND RESPONSIBILITY ACT (ECRA);

HEALTH OR RISK BASED CRITERIA; AND COMPARISON TO BACKGROUND LEVELS.

THE MARSH SOILS, THE LEACHATE SEEP AREAS, AND THE SEDIMENTS OF ALCYON LAKE, RABBIT RUN AND CHESTNUT BRANCH ALL CONTAIN CONTAMINANTS THAT ARE ALSO PRESENT IN THE SURFACE WATERS AT LEVELS IN VIOLATION OF FEDERAL AND STATE WATER QUALITY STANDARDS AND/OR GUIDELINES. THE REMOVAL AND TREATMENT OF THE SOILS AND SEDIMENTS, COUPLED WITH THE HYDRAULIC ISOLATION OF THE LANDFILL VIA AN OFF-SITE COLLECTION SYSTEM WILL ELIMINATE THE SOIL/SEDIMENT/SURFACE WATER INTERFACE AS A CONTAMINANT PATHWAY. THE CAPTURE OF SEEPAGE IN THE MARSH, COUPLED WITH THE INTERCEPTION OF CONTAMINATED GROUND WATER IN THE KIRKWOOD AQUIFER WILL ENSURE THAT CONTAMINANTS PRESENT IN THESE AREAS WILL NOT MIGRATE TO THE SURFACE WATERS OF CHESTNUT BRANCH AND TO DOWNSTREAM RECEIVING WATERS.

IN THE VICINITY OF THE LIPARI LANDFILL, THE KIRKWOOD AQUIFER HAS BEEN CHARACTERIZED AS DISCHARGING INTO CHESTNUT BRANCH STREAM FROM BOTH SIDES OF THE STREAM. IT IS NOT UTILIZED AS A DRINKING WATER SOURCE IN THE LOCAL AREA, THEREFORE, AT A MINIMUM, REMEDIATION OF THE AQUIFER WILL BE TO PROTECT SURFACE WATER QUALITY. AS SUCH, SURFACE WATER ARARS (FEDERAL WATER QUALITY CRITERIA UNDER THE CLEAN WATER ACT, FRESH WATER 2-NON TROUT UNDER N.J. SURFACE WATER STANDARDS) ARE APPROPRIATE CLEANUP STANDARDS FOR THE KIRKWOOD. TABLE 6 LISTS CHEMICAL SPECIFIC ARARS UNDER THESE STATUTES FOR CONTAMINANTS DETECTED IN THE KIRKWOOD AQUIFER. A MORE THOROUGH DISCUSSION IS CONTAINED IN THE SECTION TITLED "SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES".

IN ADDITION TO THE CHEMICAL-SPECIFIC ARARS, LOCATION-SPECIFIC AND ACTION-SPECIFIC ARARS EXIST FOR ACTIVITIES ASSOCIATED WITH THE OFF-SITE REMEDIAL ALTERNATIVES.

LOCATION-SPECIFIC ARARS ARE RESTRICTIONS PLACED ON THE CONCENTRATION OF HAZARDOUS SUBSTANCES SOLELY BECAUSE THEY ARE IN PARTICULAR LOCATIONS. LOCATION-SPECIFIC ARARS THAT APPLY TO THE OFF-SITE LIPARI AREAS INCLUDE; EXECUTIVE ORDER 11990 ON PROTECTION OF WETLANDS AND EXECUTIVE ORDER 11988 ON FLOODPLAIN MANAGEMENT. EPA HAS SOUGHT INPUT FROM OTHER AGENCIES (E.G. U.S. FISH AND WILDLIFE, U.S. ARMY CORPS) IN DEVELOPING REMEDIAL ALTERNATIVES AND RESTORATION ACTIVITIES FOR THE OFF-SITE AREAS. INPUT FROM THESE AND OTHER AGENCIES WILL BE INCLUDED DURING REMEDIAL DESIGN TO ADDRESS THE SPECIFIC DETAILS OF THE INTEGRATION OF THE REQUIREMENTS OF THESE EXECUTIVE ORDERS WITH RESPECT TO OFF-SITE WETLANDS AND WATERWAYS.

THE FISH AND WILDLIFE COORDINATION ACT OF 1958 REQUIRES THAT AN EVALUATION AND WETLANDS ASSESSMENT BE UNDERTAKEN FOR THE OFF-SITE WETLANDS THAT WILL BE IMPACTED DURING REMEDIAL ACTIONS. OFF-SITE STUDIES HAVE CHARACTERIZED THE OFF-SITE WETLANDS AREAS, ANY FUTHER EVALUATIONS AND ASSESSMENTS THAT WILL ASSIST IN THE CLEANUP AND RESTORATION EFFORTS WILL BE INCORPORATED INTO THE REMEDIAL DESIGN.

THE SITE OF THE PLACEMENT OF TREATED MATERIAL, THE ALCYON RACETRACK, IS LOCATED IN THE BOROUGH OF PITMAN. THE DOWNTOWN AREA OF PITMAN HAS BEEN DESIGNATED AS AN HISTORIC DISTRICT. IN ADDITION, BOTH THE CHESTNUT BRANCH STREAM CORRIDER AND THE ABANDONED RACETRACK MAY BE CONSIDERED SENSITIVE FOR THE PRESENCE OF CULTURAL RESOURCES UNDER THE NATIONAL HISTORIC PRESERVATION ACT. STUDIES TO DATE HAVE NOT INDICATED THAT ANY OF THE OFF-SITE AREAS ARE CONSIDERED TO BE CULTURALLY SENSITIVE AREAS, HOWEVER, A STAGE IA SURVEY WILL BE PERFORMED ON THESE AREAS DURING THE DESIGN PHASE TO FUTHER EVALUATE CULTURAL SENSITIVITY.

ACTION-SPECIFIC ARARS ARE USUALLY TECHNOLOGY- OR ACTIVITY BASED REQUIREMENTS OR LIMITATIONS ON ACTIONS TAKEN TO ADDRESS HAZARDOUS WASTES. THESE ACTIONS ARE TRIGGERED BY PARTICULAR REMEDIAL ACTIVITIES THAT ARE SELECTED TO ACCOMPLISH A REMEDY. SINCE THERE ARE SEVERAL ACTIONS TO BE TAKEN IN THE OFF-SITE AREAS, A NUMBER OF DIFFERENT REQUIREMENTS HAVE BEEN REVIEWED. THE ACTION-SPECIFIC REQUIREMENTS DO NOT IN THEMSELVES DETERMINE THE REMEDIAL ALTERNATIVE, RATHER THEY INDICATE HOW A SELECTED ALTERNATIVE MUST BE ACHIEVED.

DURING THE DEVELOPMENT OF THE OFF-SITE REMEDIAL DESIGN, ACTION SPECIFIC ARARS FOR DREDGING THE STREAMS AND LAKE THAT WILL BE EVALUATED INCLUDE: SECTION 10 OF THE RIVERS AND HARBORS ACT AND U.S. ARMY CORPS OF ENGINEERS REGULATIONS. ACTION-SPECIFIC REGULATIONS REGARDING TREATMENT ACTIONS THAT WILL BE UTILIZED DURING REMEDIAL DESIGN INCLUDE: RCRA REGULATIONS REGARDING TEMPORARY WASTE PILES (STAGING AREAS DURING TREATMENT) AND NEW JERSEY ADMINISTRATIVE CODE REGULATIONS FOR AIR EMISSIONS (OFF- GASES FROM ROTARY KILN DRYER).

A COMPREHENSIVE LIST OF CANDIDATE REMEDIAL TECHNOLOGIES WAS COMPILED TO CHARACTERIZE EACH TECHNOLOGY AND DETERMINE ITS APPLICABILITY TO THE OFF-SITE LIPARI AREAS. THE REMEDIAL TECHNOLOGY SCREENING SUMMARY, WHICH IS INCLUDED AS TABLE 7, PROVIDES BRIEF RATIONALES AS TO WHY SOME OF THE TECHNOLOGIES SCREENED WERE INCLUDED FOR OR EXCLUDED FROM FURTHER CONSIDERATION.

THE TECHNOLOGIES THAT WERE RETAINED AFTER THE PRELIMINARY SCREENING PROCESS WERE ASSEMBLED IN VARIOUS COMBINATIONS TO FORM 19 GENERAL RESPONSE ACTIONS FOR THE OFF-SITE AREAS. THESE ACTIONS FALL INTO 10 GROUPS: NO ACTION, SOIL COVERING, EXCAVATION, DREDGING, ON-SITE TREATMENT, ON-SITE DISPOSAL, OFF-SITE DISPOSAL, OFF-SITE COLLECTION SYSTEMS, AND GROUND WATER RECOVERY AND TREATMENT. IN ADDITION, AN INTERIM MEASURE TO SUPPRESS VOLATILE EMISSIONS ORIGINATING IN THE CHESTNUT BRANCH MARSH WAS DEVELOPED.

FROM THE 19 GENERAL RESPONSE ACTIONS, THE COMPONENTS OF 24 ALTERNATIVES AND SIX DISPOSAL/PLACEMENT OPTIONS WERE DEVELOPED AND ARE PRESENTED BELOW. IN ADDITION, ALTERNATIVE-SPECIFIC VARIATIONS INVOLVING ONE OR MORE OF THE DISPOSAL/PLACEMENT OPTIONS AND/OR EXCAVATION OPTIONS WERE DEVELOPED.

REMEDIAL ALTERNATIVES

THE DESCRIPTIONS OF THE REMEDIAL ALTERNATIVES ARE GROUPED AND PRESENTED IN THE FOLLOWING MANNER:

CHESTNUT BRANCH MARSH COLLECTION SYSTEM: ALTERNATIVES 1-3

CHESTNUT BRANCH MARSH SOIL REMEDIATION: ALTERNATIVES 4-10

ALCYON LAKE REMEDIATION: ALTERNATIVES 11-12

RABBIT RUN REMEDIATION: ALTERNATIVES 13-14

KIRKWOOD AQUIFER COLLECTION SYSTEM: ALTERNATIVES 15-16

CHESTNUT BRANCH STREAM REMEDIATION: ALTERNATIVES 17-18

INTERIM ACTION FOR CHESTNUT BRANCH MARSH: ALTERNATIVE 19

ALTERNATIVE 1: WELLPOINTS WEST OF THE SEEPAGE FACE

ALTERNATIVE 1 INVOLVES THE INSTALLATION OF A WELLPOINT SYSTEM (60-120 WELLS) IN CHESTNUT BRANCH MARSH BETWEEN THE SEEPAGE FACE AND THE CONTAINMENT SYSTEM. THIS WELLPOINT NETWORK WOULD FUNCTION AS AN OFF-SITE COLLECTION SYSTEM TO CAPTURE ANY SEEPAGE RESULTING FROM THE ON-SITE FLUSHING ACTION. THE COLLECTED SEEPAGE WOULD BE TREATED AT THE ON-SITE TREATMENT FACILITY. THIS OPTION WOULD REQUIRE EXTENSIVE MAINTENANCE. FUTHERMORE, UP TO 10 PERCENT OF THE LEACHATE MAY NOT BE CAPTURED BY THE WELLPOINT SYSTEM. THE APPROXIMATE LOCATIONS OF ALTERNATIVES 1, 2, AND 3 ARE ILLUSTRATED IN FIGURE 4.

ALTERNATIVE 2A: DRAINAGE DITCH NEAR SEEPAGE FACE

ALTERNATIVE 2A INVOLVES THE INSTALLATION OF A FRENCH DRAIN NEAR THE BASE OF THE LEACHATE SEEPAGE FACE IN CHESTNUT BRANCH MARSH TO COLLECT ANY SEEPAGE FROM THE ON-SITE FLUSHING ACTION. THE DRAIN WOULD CAPTURE ESSENTIALLY ALL OF THE LEACHATE THAT MAY MIGRATE THROUGH THE SLURRY WALL. THIS WOULD ENSURE THAT ANY FUTURE CONTAMINANT MIGRATION WOULD NOT AFFECT THE OFF-SITE AREAS. AS WITH ALTERNATIVE 1, THE COLLECTED SEEPAGE WOULD BE TREATED AT THE ON-SITE TREATMENT FACILITY. EXCAVATED MARSH SOILS WOULD BE HANDLED EITHER AS A RCRA WASTE OR TREATED TO REMOVE VOLATILE ORGANICS AND DISPOSED OF AS A NON-HAZARDOUS MATERIAL.

ALTERNATIVE 2B: DRAINAGE DITCH NEAR SEEPAGE FACE WITH IMPERMEABLE COVER

ALTERNATIVE 2B INVOLVES THE SAME TECHNOLOGY AND STEPS AS DOES ALTERNATIVE 2A. FUTHERMORE, THIS ALTERNATIVE WOULD REQUIRE THE INSTALLATION OF AN IMPERMEABLE CAP OVER THE DRAIN AND PORTIONS OF THE SURROUNDING MARSH. THIS CAP WOULD REDUCE THE AMOUNT OF RAIN WATER INFILTRATION INTO THE TRENCH AS WELL AS FURTHER REDUCE THE POSSIBILITY OF VOLATILE EMISSIONS FROM THE MARSH SOILS BETWEEN THE DRAIN AND THE SLURRY WALL. THE DISPOSAL OPTIONS FOR EXCAVATED SOILS ARE THE SAME AS FOR ALTERNATIVE 2A. THE REDUCTION IN RAINWATER INFILTRATION WOULD REDUCE LONG-TERM OPERATION AND MAINTENANCE COSTS ASSOCIATED WITH LEACHATE COLLECTION AND TREATMENT.

ALTERNATIVE 3: WELLPOINTS EAST OF THE SEEPAGE FACE

ALTERNATIVE 3 INVOLVES THE INSTALLATION OF A WELLPOINT SYSTEM IN CHESTNUT BRANCH MARSH BETWEEN THE SEEPAGE FACE AND CHESTNUT BRANCH TO COLLECT ANY SEEPAGE FROM THE ON-SITE FLUSHING ACTION. AS WITH ALTERNATIVES 1 AND 2, THE COLLECTED SEEPAGE WOULD BE TREATED AT THE ON-SITE TREATMENT FACILITY. IT IS EXPECTED THAT THIS ALTERNATIVE WILL RESULT IN LOWER WATER LEVELS IN THE MARSH, RESULTING IN A REDUCTION IN THE AMOUNT OF VOLATILE EMISSIONS ASSOCIATED WITH THE LEACHATE SEEPS. THIS ALTERNATIVE IS BEST SUITED FOR SELECTION WITH A NO ACTION ALTERNATIVE FOR THE MARSH ITSELF SINCE THE AREA BETWEEN THE WELLPOINTS AND THE SLURRY WALL WOULD EXPECT TO BE REMEDIATED THROUGH NATURAL PROCESSES IF NO ACTION WERE TAKEN. IT IS ANTICIPATED THAT THE PROCESS OF NATURAL DEGRADATION WOULD TAKE SEVERAL YEARS.

ALTERNATIVE 4: NO ACTION IN CHESTNUT BRANCH MARSH

UNDER THE NO ACTION ALTERNATIVE, IT IS ASSUMED THAT AN OFF-SITE COLLECTION SYSTEM WOULD BE IMPLEMENTED TO MEET THE INTENT OF THE SEPTEMBER 30, 1985 ROD. THIS ALTERNATIVE WOULD RELY ON NATURAL FLUSHING AND DEGRADATION OF CONTAMINANTS IN THE MARSH OVER TIME. HOWEVER, FOR SEVERAL YEARS, THE MARSH WOULD CONTINUE AS A SOURCE OF CONTAMINATION POSING A RISK TO PUBLIC HEALTH AND THE ENVIRONMENT.

ALTERNATIVE 5: PERMEABLE COVER IN CHESTNUT BRANCH MARSH

ALTERNATIVE 5 INVOLVES THE REMOVAL OF THE VEGETATION IN THE MARSH AND PLACEMENT OF A PERMEABLE SOIL COVER OVER ALL OR A PORTION OF THE MARSH SOILS. WHILE THIS ALTERNATIVE WILL RESULT IN A REDUCTION OF PUBLIC HEALTH RISKS ASSOCIATED WITH CONTAMINANTS IN THE MARSH SOILS AND EMISSIONS FROM THE SOILS, IT WOULD NOT REDUCE THE AMOUNT OF CONTAMINATION PRESENT. THE POTENTIAL FOR CONTAMINANT MIGRATION AND DISCHARGE INTO CHESTNUT BRANCH STREAM WOULD CONTINUE TO EXIST. THE COVER WOULD CONSIST OF TWO TO THREE FEET OF PERMEABLE SAND OR GRAVEL OVER APPROXIMATELY 193,000 SQUARE FEET OF THE MARSH.

ALTERNATIVE 6: IMPERMEABLE COVER IN CHESTNUT BRANCH MARSH

ALTERNATIVE 6 INVOLVES THE SAME TECHNICAL APPROACH AS ALTER NATIVE 5. THIS ALTERNATIVE ALSO WOULD UTILIZE A SYNTHETIC, IMPERMEABLE CAP ON TOP OF THE SOIL COVER. THE PRESENCE OF THE CAP WOULD ADD AN ADDITIONAL MEASURE OF SAFETY WITH RESPECT TO THE ELIMINATION OF CONTAMINANT PATHWAYS (AIR EMISSIONS AND CONTACT WITH SOILS) THAT HAVE BEEN CHARACTERIZED AS POSING POTENTIAL HUMAN HEALTH THREATS. AS WITH ALTERNATIVE 5, CONTAMINANTS WOULD PERSIST IN THE UNDERLYING MARSH SOILS AND COULD CONTINUE TO MIGRATE TO CHESTNUT BRANCH AND IMPACT LOCAL SURFACE WATER QUALITY.

ALTERNATIVE 7: TOTAL EXCAVATION OF THE CHESTNUT BRANCH MARSH

ALTERNATIVE 7 INVOLVES THE EXCAVATION OF CHESTNUT BRANCH MARSH SOILS TO THE TOP OF THE KIRKWOOD CLAY FORMATION. THE EXCAVATION ACTIVITY IN THE MARSH WOULD INVOLVE DEWATERING THE MARSH AREA, CLEARING AND GRUBBING OF THE VEGETATION, EXCAVATION, STAGING AND DISPOSAL OF THE CONTAMINATED SOIL, AND SOIL REPLACEMENT, COMPACTION AND RESORATION OF THE MARSH. APPROPRIATE SURFACE WATER AND SEDIMENTATION CONTROL MEASURES WOULD BE INCORPORATED. WATER FROM THE DEWATERING OPERATION WOULD BE PUMPED TO THE ON-SITE TREATMENT FACILITY. A VOLUME OF APPROXIMATELY 71,500 CUBIC YARDS WOULD BE EXCAVATED FROM THE MARSH. THE REMOVED SOIL WOULD THEN BE DISPOSED OF IN A NEW ON-SITE RCRA FACILITY (OPTION A) OR TRANSPORTED FOR DISPOSAL TO AN OFF-SITE RCRA FACILITY (OPTION B). ALTERNATIVE 7 ALSO CONTAINS A COST OPTION TO EXCAVATE APPROXIMATELY TWO FEET OF SOIL IN ZONES 1 AND 2 OF THE MARSH, WHILE EXCAVATING APPROXIMATELY 10 FEET OF SOIL FROM ZONE 3, THE AREA OF HIGHEST CONTAMINATION. ORGANIC CONTAMINANTS HAVE BEEN DETECTED IN THE SURFACE SOILS OF ZONE 1 AND 2 AT LOWER CONCENTRATIONS THAN IN ZONE 3. EXCAVATION AND DISPOSAL OF MARSH SOILS WOULD RESULT IN ELIMINATION OF CONTAMINANT PATHWAYS ASSOCIATED WITH THE MARSH.

ALTERNATIVE 8: PARTIAL EXCAVATION OF CHESTNUT BRANCH MARSH

PARTIAL EXCAVATION OF CHESTNUT BRANCH MARSH INVOLVES EXCAVATION OF APPROXIMATELY 19,900 CUBIC YARDS OF SOIL FROM ZONE 3 WITHIN THE MARSH. THIS IS THE AREA CHARACTERIZED AS THE AREA OF ACTIVE LEACHATE SEEPS AND HAZARDOUS EMISSIONS. CONTAMINANTS PRESENT IN THE SURFACE SOILS IN OTHER AREAS OF THE MARSH MAY CONTINUE TO MIGRATE TO SURFACE WATERS. THE DISPOSAL OF THE CONTAMINANTED SOIL WOULD BE VIA DISPOSAL OPTION A OR B. THE ACTIVITIES ASSOCIATED WITH THE IMPLEMENTATION OF THIS ALTERNATIVE ARE THE SAME AS THOSE DESCRIBED FOR ALTERNATIVE 7.

ALTERNATIVE 9A: TOTAL EXCAVATION OF CHESTNUT BRANCH MARSH, TREATMENT FOR ORGANICS, REPLACE SOILS IN THE MARSH.

ALTERNATIVE 9A INVOLVES THE COMPLETE EXCAVATION OF MARSH SOILS TO THE TOP OF THE KIRKWOOD CLAY, FOLLOWED BY TREATMENT WITH A ROTARY KILN DRIER. THIS ALTERNATIVE INCLUDES THE SAME ACTIVITIES ASSOCIATED WITH THE IMPLEMENTATION OF ALTERNATIVE 7 EXCEPT THAT CONTAMINATED SOILS WOULD BE TRANSPORTED TO A TEMPORARY STORAGE AREA WHERE THEY WOULD BE THERMALLY TREATED WITH A ROTARY KILN DRIER TO REMOVE ORGANICS PRIOR TO THEIR DISPOSAL. THE STAGING AREA WOULD COMPLY WITH RCRA REGULATIONS THAT DETAIL THE DESIGN AND CONSTRUCTION OF TEMPORARY WASTE STORAGE AREAS. THE ROTARY DRIER UNIT WOULD BE LOCATED IN THE STAGING AREA.

A ROTARY KILN DRIER OPERATES AT TEMPERATURES UP TO ABOUT 600`F. THE MATERIAL PLACED IN SUCH A UNIT IS CONSTANTLY TURNED OVER AND MIXED AS THE KILN ROTATES. THE OPERATING TEMPERATURE WILL RESULT IN SUBSTANTIAL REMOVAL OF ORGANIC CONTAMINANTS FROM THE SOIL; HOWEVER, METALS ARE NOT EXPECTED TO BE SIGNIFICANTLY AFFECTED BY THIS TECHNOLOGY. THE OFF-GASES FROM THIS UNIT WOULD BE CAPTURED ON CARBON FILTERS OR A SIMILAR ADSORBENT, OR BE TREATED.

THE TREATED SOIL WOULD BE PLACED BACK INTO THE MARSH AND THE MARSH WOULD BE RESTORED. HOWEVER, DUE TO THE

WET MARSH ENVIRONMENT, SOILS PLACED BACK IN THE MARSH MAY CONTINUE TO BE A SOURCE OF CONTAMINANT (METALS) MIGRATION TO NEARBY SURFACE WATERS. THIS ALTERNATIVE ALSO CONTAINS A COST OPTION FOR LIMITED EXCAVATION OF ZONES 1 AND 2 AND TOTAL EXCAVATION OF ZONE 3 SIMILAR TO THE ONE DESCRIBED IN ALTERNATIVE 7.

ALTERNATIVE 9 B: TOTAL EXCAVATION OF CHESTNUT BRANCH MARSH, TREATMENT FOR ORGANICS, DISPOSAL OF SOILS AS A NON-HAZARDOUS MATERIAL

THIS ALTERNATIVE INVOLVES THE SAME ACTIVITIES ASSOCIATED WITH THE IMPLEMENTATION OF ALTERNATIVE 9A EXCEPT THAT TREATED SOILS WOULD THEN BE DISPOSED OF AS A NON-HAZARDOUS MATERIAL. THIS ALTERNATIVE ALSO HAS A SIMILAR COST OPTION FOR EXCAVATION TO APPROXIMATELY TWO FEET. ALTERNATIVE 9B DIFFERS IN THAT THE TREATED SOILS MAY BE CLASSIFIABLE AS NON-HAZARDOUS AND BE DISPOSED IN A SUITABLE OFF-SITE LOCATION. IN THE FS, ALCYON RACETRACK, TWO MUNICIPAL LANDFILLS, AND DISPOSAL ON TOP OF THE LIPARI LANDFILL, WERE EVALUATED FOR PLACEMENT OF THE TREATED SOIL. RESTORATION ACTIONS WOULD BE UNDERTAKEN AT THE MARSH.

ALTERNATIVE 10A: PARTIAL EXCAVATION OF CHESTNUT BRANCH MARSH, TREATMENT FOR ORGANICS, REPLACE SOILS IN THE MARSH

ALTERNATIVE 10A INVOLVES EXCAVATION OF APPROXIMATELY 19,900 CUBIC YARDS OF SOILS FROM ZONE 3 IN THE MARSH. THIS ALTERNATIVE UTILIZES THE SAME TECHNOLOGY AND STEPS AS ALTERNATIVE 9A. CONTAMINANTS PRESENT IN THE OTHER AREAS OF THE MARSH COULD CONTINUE TO MIGRATE TO LOCAL SURFACE WATERS. RESTORATION ACTIONS WOULD BE UNDERTAKEN FOR THE MARSH.

ALTERNATIVE 10B: PARTIAL EXCAVATION OF CHESTNUT BRANCH MARSH, TREATMENT FOR ORGANICS, DISPOSAL OF SOILS AS A NON-HAZARDOUS MATERIAL

ALTERNATIVE 10B INVOLVES EXCAVATION AND THERMAL TREATMENT OF APPROXIMATELY 19,900 CUBIC YARDS OF SOILS FROM ZONE 3 OF THE MARSH AND ALSO INCLUDES A COSTING OPTION FOR SIMILAR ACTIONS IN ZONES 1 AND 2 TO APPROXIMATELY TWO FEET. THIS ALTERNATIVE UTILIZES THE SAME TECHNOLOGY AND STEPS AS ALTERNATIVE 9B. RESTORATION ACTIONS WOULD BE UNDERTAKEN FOR THE MARSH. DISPOSAL OF THE SEDIMENTS IN A DRIER ENVIRONMENT WOULD MINIMIZE ANY POTENTIAL MIGRATION OF METALS INTO LOCAL SURFACE WATERS.

ALTERNATIVE 11: NO ACTION TO REMEDIATE ALCYON LAKE SEDIMENTS

UNDER THE NO ACTION ALTERNATIVE, IT IS ASSUMED THAT AN OFF-SITE COLLECTION SYSTEM WOULD INTERCEPT CONTAMINANT MIGRATION TO THE SEDIMENTS AND SURFACE WATERS OF ALCYON LAKE. ONCE UPSTREAM CONTAMINANT PATHWAYS WERE ELIMINATED, IN A RELATIVELY SHORT PERIOD OF TIME THE CONTAMINANT CONCENTRATIONS IN THE WATER COLUMN WOULD BE EXPECTED TO DECLINE. HOWEVER, CONTAMINANTS PRESENT IN THE SEDIMENTS WOULD PERSIST FOR AN UNDETERMINED PERIOD OF TIME. THE POTENTIAL FOR CONTAMINANTS LEACHING FROM THE SEDIMENTS INTO THE WATER COLUMN WOULD CONTINUE.

ALTERNATIVE 12A: DREDGE AND DEWATER SEDIMENTS FROM ALCYON LAKE, DISPOSAL OF SEDIMENTS IN A RCRA FACILITY

ALTERNATIVE 12A INVOLVES THE HYDRAULIC DREDGING OF THE SEDIMENTS FROM ALCYON LAKE, FOLLOWED BY DEWATERING WITH FILTER PRESSES OR SIMILAR EQUIPMENT. THE FILTER PRESS WATER WOULD BE ROUTED TO THE ON-SITE TREATMENT FACILITY. APPROXIMATELY 140,000 CUBIC YARDS OF DREDGED MATERIAL WOULD BE PUMPED FROM THE LAKE DIRECTLY TO PORTABLE FILTER PRESSES LOCATED NEAR THE SHORE. THE WATER REMOVED FROM THE DREDGED MATERIAL WOULD BE DISCHARGED TO THE ON-SITE TREATMENT FACILITY. THE FINAL VOLUME OF THE DEWATERED SEDIMENTS IS ESTIMATED TO BE 56,000 CUBIC YARDS. THE DEWATERED SEDIMENTS WOULD THEN BE PLACED IN A NEW ON-SITE RCRA FACILITY (OPTION A) OR TRANSPORTED TO AN OFF-SITE RCRA FACILITY (OPTION B) FOR DISPOSAL. THE ACTIVITIES INVOLVED IN TRANSPORTATION AND THE DISPOSAL AT EITHER FACILITY WOULD BE THE SAME AS IN ALTERNATIVE 7. THIS ALTERNATIVE WOULD RESULT IN THE REMOVAL OF CONTAMINATED SEDIMENTS, AND THE POTENTIAL FOR CONTAMINANT LEACHING FROM THE SEDIMENTS INTO THE LAKE WATERS WOULD BE ELIMINATED.

ALTERNATIVE 12B: DREDGE AND DEWATER SEDIMENTS FROM ALCYON LAKE, TREATMENT FOR ORGANICS, DISPOSAL OF SOILS AS A NON-HAZARDOUS MATERIAL

THIS ALTERNATIVE INVOLVES THE SAME ACTIVITIES ASSOCIATED WITH THE DREDGING OF SEDIMENTS FROM ALCYON LAKE AS DISCUSSED IN ALTERNATIVE 12A, BUT INCLUDES THERMAL TREATMENT OF SEDIMENTS TO REMOVE ORGANIC CONTAMINANTS AND

DISPOSAL AS A NON-HAZARDOUS MATERIAL. AFTER DEWATERING, THE SEDIMENTS WOULD BE TREATED THERMALLY WITH A ROTARY KILN DRIER TO REMOVE ORGANIC CONTAMINANTS. THE SEDIMENTS MAY THEN BE CLASSIFIABLE AS NON-HAZARDOUS AND PLACED AT A SUITABLE OFF-SITE LOCATION. AS IN ALTERNATIVE 12A, THIS ALTERNATIVE WOULD REMOVE THE CONTAMINATED SEDIMENTS, THEREBY ELIMINATING ANY POTENTIAL CONTAMINANT LEACHING FROM THE SEDIMENTS INTO THE WATER OF THE LAKE.

ALTERNATIVE 13: NO ACTION IN RABBIT RUN

UNDER THIS NO ACTION ALTERNATIVE, CONTAMINANTS PRESENT IN RABBIT RUN WOULD CONTINUE TO PERSIST AND AFFECT THE WATER QUALITY OF RABBIT RUN AND DOWNSTREAM RECEIVING WATERS.

ALTERNATIVE 14A: DREDGE AND DEWATER RABBIT RUN SEDIMENTS, DISPOSAL OF SEDIMENTS IN A RCRA FACILITY

ALTERNATIVE 14A INVOLVES THE REMOVAL OF APPROXIMATELY 400 CUBIC YARDS OF RABBIT RUN SEDIMENTS WITH A BACKHOE OR SIMILAR EQUIPMENT AND PLACEMENT IN A DEWATERING BASIN TO SEPARATE THE WATER AND THE SOLIDS. THE DEWATERED LIQUIDS WOULD BE TREATED AT THE ON-SITE FACILITY. THE SOLIDS WOULD BE DISPOSED OF IN A NEW ON-SITE RCRA FACILITY (OPTION A) OR TRANSPORTED TO AN OFF-SITE RCRA FACILITY (OPTION B) FOR DISPOSAL. RESTORATION ACTIONS WOULD BE TAKEN FOR RABBIT RUN AS NECESSARY.

ALTERNATIVE 14B: DREDGE AND DEWATER RABBIT RUN SEDIMENTS, TREATMENT FOR ORGANICS, DISPOSAL OF SEDIMENTS AS A NON-HAZARDOUS MATERIAL

ALTERNATIVE 14B UTILIZES THE SAME TECHNOLOGY AS ALTERNATIVE 14A WITH AN ADDITIONAL TREATMENT STEP. AFTER DEWATERING, THE SEDIMENTS WOULD BE TREATED WITH A ROTARY KILN DRIER TO REMOVE ORGANIC CONTAMINANTS. THE SEDIMENTS MAY THEN BE CLASSIFIABLE AS NON-HAZARDOUS AND PLACED AT A SUITABLE OFF-SITE LOCATION. LIQUIDS WOULD BE TREATED AT THE ON-SITE FACILITY. RESTORATION ACTIONS WOULD BE TAKEN FOR RABBIT RUN AS NEEDED.

ALTERNATIVE 15: NO ACTION IN THE KIRKWOOD AQUIFER

UNDER THIS NO ACTION ALTERNATIVE, CONTAMINANTS PRESENT IN THE KIRKWOOD AQUIFER WOULD CONTINUE TO MIGRATE. THE OFF-SITE RI REPORTS INDICATE THAT THE KIRKWOOD AQUIFER DISCHARGES LOCALLY INTO CHESTNUT BRANCH AND ALCYON LAKE. WHILE THIS AQUIFER IS NOT UTILIZED AS A DRINKING WATER SOURCE IN THE STUDY AREA, CONTAMINANTS DISCHARGED TO SURFACE WATERS ARE LIKELY TO RESULT IN CONTAMINANT LEVELS THAT EXCEED FEDERAL WATER QUALITY CRITERIA FOR SURFACE WATERS AS INDICATED BY EVALUATIONS PERFORMED DURING THE ON-SITE RI/FS.

ALTERNATIVE 16: PUMP AND TREAT THE KIRKWOOD AQUIFER

ALTERNATIVE 16 INVOLVES THE UTILIZATION OF EXISTING KIRKWOOD WELLS AND THE INSTALLATION OF PUMPS AND A PIPING SYSTEM TO THE ON-SITE TREATMENT FACILITY. THE KIRKWOOD AQUIFER WOULD BE PUMPED FOR THE DURATION OF THE ON-SITE FLUSHING TO ENSURE THAT ALL EXISTING AND POTENTIAL FUTURE CONTAMINATION IS CONTAINED, REMOVED AND TREATED. IF NEEDED, PUMPING WOULD CONTINUE AFTER THE FLUSHING EFFORT HAS BEEN COMPLETED. PUMPING RATES, DURATION OF PUMPING, AND CLEANUP LEVELS TO INSURE THE PROTECTION OF SURFACE WATER QUALITY, AND MONITORING ASSOCIATED WITH THIS ALTERNATIVE WILL BE INCORPORATED INTO THE MONITORING PLAN THAT IS BEING DEVELOPED TO EVALUATE THE EFFECTIVENESS OF THE ON-SITE REMEDIAL ACTIONS.

ALTERNATIVE 17: NO ACTION IN CHESTNUT BRANCH STREAM

UNDER THIS NO ACTION ALTERNATIVE, CONTAMINANTS PRESENT IN CHESTNUT BRANCH STREAM WOULD NOT BE REMEDIATED. A POTENTIAL FOR ADVERSE AFFECTS ON THE WATER QUALITY OF THE STREAM WOULD CONTINUE TO EXIST DUE TO THE LEACHING OF CONTAMINANTS FROM THE STREAM SEDIMENTS.

ALTERNATIVE 18A: DREDGE AND DEWATER CHESTNUT BRANCH SEDIMENTS, DISPOSAL AT A RCRA FACILITY

ALTERNATIVE 18A INVOLVES THE SAME TECHNOLOGY AND DISPOSAL OPTIONS AS ALTERNATIVE 14A FOR THE RABBIT RUN SEDIMENTS. RESTORATION ACTIONS WOULD BE UNDERTAKEN FOR CHESTNUT BRANCH AS NECESSARY.

ALTERNATIVE 18B: DREDGE AND DEWATER CHESTNUT BRANCH SEDIMENTS, TREATMENT FOR ORGANICS, DISPOSAL AS A

NON-HAZARDOUS MATERIAL

ALTERNATIVE 18B INVOLVES THE SAME TECHNOLOGY AND DISPOSAL OPTIONS AS ALTERNATIVE 14B FOR RABBIT RUN. RESTORATION ACTIONS WOULD BE UNDERTAKEN FOR CHESTNUT BRANCH AS NECESSARY.

ALTERNATIVE 19: INTERIM MEASURE IN CHESTNUT BRANCH MARSH

ALTERNATIVE 19 INVOLVES THE UNDERTAKING OF TEMPORARY REMEDIAL MEASURES IN CHESTNUT BRANCH MARSH TO MITIGATE VOLATILE EMISSIONS FROM THE SEEPAGE FACE AREAS. THIS MEASURE WOULD BE UNDERTAKEN WHEN HAZARDOUS EMISSIONS FROM THE MARSH ARE CONSIDERED TO POSE A POTENTIAL HUMAN HEALTH THREAT. VOLATILE EMISSIONS FROM THE MARSH ARE MOST PRONOUNCED DURING THE WARMER SPRING AND SUMMER MONTHS. THE INTERIM MEASURES COULD INVOLVE CLEARING THE VEGETATION IN PORTIONS OF ZONE 3 OF THE MARSH FOLLOWED BY THE PLACEMENT OF ABSORPITVE MATERIALS AND A TEMPORARY CAP, OR THE POSSIBLE USE OF VAPOR SUPPRESSANT TECHNOLOGIES. VAPOR SUPPRESSANT FOAMS ARE AVAILABLE BUT REQUIRE REPEATED APPLICATIONS TO BE EFFECTIVE. THE PLACEMENT OF ABSORPTIVE MATERIALS AND A TEMPORARY CAP WOULD BE EFFECTIVE AND REQUIRE LITTLE OR NO MAINTENANCE.

#DOD
DISPOSAL OPTIONS DISCUSSION

IN ADDITION TO RETURNING TREATED SOILS AND SEDIMENTS TO THEIR PLACES OF ORIGIN, THE MARSH, THE STREAMS, THE LAKE, AND SIX OTHER LOCATIONS WERE FULLY EVALUATED AS POTENTIAL LOCATIONS FOR THE DISPOSAL OR PLACEMENT OF TREATED AND NON-TREATED MATERIALS. A DISCUSSION OF THE INDIVIDUAL DISPOSAL OPTIONS IS PRESENTED BELOW.

OPTION

(A) CONSTRUCT A NEW ON-SITE RCRA FACILITY.

WHILE THE CONSTRUCTION OF A NEW ON-SITE RCRA FACILITY IS TECHNICALLY FEASIBLE, THERE ARE SEVERAL CONSIDERATIONS THAT DETRACT FROM THIS OPTION AS A PREFERRED DISPOSAL LOCATION. THE AVAILABILITY OF LAND FOR SUCH A FACILITY IS UNCERTAIN. IN THE EVENT THAT LAND WAS TO BE SECURED FOR THIS OPTION, THE COMMUNITY PERCEPTION WOULD BE EXTREMELY NEGATIVE. ALSO, WHILE THIS OPTION WOULD RESULT IN A REDUCTION IN THE MOBILITY OF CONTAMINANTS AND WOULD MEET ARARS, IT WOULD NOT REDUCE VOLUME OR TOXICITY AND DOES NOT ADDRESS THE PREFERENCE IN SARA TO UTILIZE TREATMENT TECHNOLOGIES OR PROVIDE A PERMANENT SOLUTION.

(B) TRANSPORT CONTAMINATED MATERIALS TO AN EXISTING RCRA FACILITY.

THIS DISPOSAL OPTION WOULD ATTAIN ARARS AND RESULT IN A REDUCTION OF CONTAMINANT MOBILITY. AS DISCUSSED ABOVE, IT WILL NOT PROVIDE A PERMANENT SOLUTION OR UTILIZE TREATMENT TECHNOLOGIES.

(C) PLACEMENT OF TREATED MATERIALS AT THE ALCYON RACETRACK OR ON TOP OF THE EXISTING LIPARI LANDFILL.

ALCYON RACETRACK - AS SHOWN IN FIGURE 1, THE RACETRACK IS ADJACENT TO ALCYON LAKE. ALCYON PARK, A PUBLIC PARK TO THE EAST AND SOUTH, IS OWNED BY THE BOROUGH OF PITMAN, AND IS MODERATELY USED BY THE LOCAL POPULACE. THE RACETRACK AND THE WOODS TO THE WEST HAVE RECENTLY BEEN PURCHASED BY THE BOROUGH OF PITMAN TO ADDRESS OPEN SPACE CONSIDERATIONS FOR THE BOROUGH AND TO ASSIST IN THE OFF-SITE REMEDIAL PROCESS. THE RACETRACK IS A CLAY BOWL THAT IS BUILT UP TO AN ELEVATION OF SIX TO EIGHT FEET HIGHER ON THE EASTERN SIDE THAN THE ADJACENT PARK. IT IS APPROXIMATELY 200 FEET FROM THE SHORE OF ALCYON LAKE AND IS APPROXIMATELY 35 FEET HIGHER IN ELEVATION THAN THE LAKE SURFACE. ALTHOUGH THE PRECISE DEPTH TO GROUND WATER AT THE RACE TRACK IS UNKNOWN, WELLS IN THE VICINITY INDICATE THAT THE TOP OF THE GROUND WATER TABLE IS TYPICALLY 20 TO 25 FEET BELOW LOCAL NATURAL TOPOGRAPHIC CONTOURS. THE PLACEMENT OF TREATED MATERIALS AT THE RACETRACK WILL ATTAIN ARARS, REDUCE MOBILITY, TOXICITY AND VOLUME, AND IS HIGHLY COST EFFECTIVE. AS SHOWN IN TABLE 7, THE RESIDUAL METALS WILL ATTAIN ALL PRESENT GUIDELINES FOR SOILS. THIS OPTION WILL BE THE EASIEST TO IMPLEMENT WITH RESPECT TO THE REMEDIATION OF ALCYON LAKE. THE BOROUGH HAS AGREED TO UTILIZE ALCYON PARK AS A STAGING AREA FOR DEWATERING AND TREATMENT, AND THE USE OF THE RACETRACK FOR PLACEMENT OF THE TREATED MATERIALS. ENGINEERING STUDIES ON PRESENT RACETRACK SOIL CONDITIONS AS WELL AS POST-TREATMENT SOIL AND SEDIMENT CONDITIONS WILL BE REQUIRED DURING THE REMEDIAL DESIGN TO ENSURE THAT BOTH THE SHORT-TERM AND LONG-TERM ENVIRONMENTAL AND AESTHETIC CONCERNS ARE ADDRESSED.

LIPARI LANDFILL - THE PLACEMENT OF TREATED MATERIAL ON TOP OF THE EXISTING LIPARI LANDFILL HAS SEVERAL DRAWBACKS. AN UNDERTAKING OF THIS NATURE WOULD REQUIRE EXTENSIVE COORDINATION WITH THE ON-SITE CONSTRUCTION ACTIVITIES. THE EXISTING DESIGN FOR THE INJECTION/EXTRACTION WELL FIELD WOULD HAVE TO BE MODIFIED TO ACCOMODATE THE ADDITION OF THREE TO FIVE FEET OF TREATED SOILS. THE IMPACT OF THIS ADDITIONAL SOIL ON THE INTEGRITY OF THE EXISTING CAP IS UNKNOWN. FURTHERMORE, WHILE FLUSHING OF CONTAMINANTS HAS PROVED SUCCESSFUL AT OTHER AT OTHER HAZARDOUS WASTE SITES, AND PRELIMINARY TESTS INDICATE THAT IT ALSO WILL BE SUCCESSFUL AT THE LIPARI SITE, EPA HAS MAINTAINED THAT, IN THE EVENT FLUSHING IS NOT SUCCESSFUL AT LIPARI, OTHER REMEDIAL MEASURES WILL BE PURSUED. THE PRESENCE OF ADDITIONAL MATERIAL ON THE EXISTING SITE WOULD ADD A MEASURE OF DIFFICULTY IN THE EVENT OF ANY FUTURE INTRUSIVE ACTIVITIES, INCLUDING ON-SITE SOIL MONITORING.

D) DISPOSE OF TREATED MATERIALS AT THE GLOUCESTER COUNTY MUNICIPAL LANDFILL.

DISPOSAL OF TREATED SOILS AND SEDIMENTS AT THIS FACILITY WOULD ATTAIN ARARS, REDUCE MOBILITY, AND UTILIZE TREATMENT AS A PERMANENT REMEDY. THE COST WOULD BE SIGNIFICANTLY HIGHER THAN PLACEMENT AT EITHER ALCYON RACETRACK OR THE LIPARI LANDFILL. THERE ALSO MAY EXIST A PROBLEM WITH RESOURCE CAPACITY OR AVAILABILITY.

LANDFILL CAPACITY AND THE NEED FOR FILL MATERIAL IS VERY LIMITED IN NEW JERSEY. THE AVAILABILITY OF THE USE OF MUNICIPAL LANDFILL CELLS FOR TREATED, NON-HAZARDOUS MATERIAL IS UNCERTAIN. SIMILAR INSTITUTIONAL PROBLEMS MAY BE ENCOUNTERED IN PROPOSING TO USE THE TREATED MATERIAL AS FILL OR COVER. ALSO, IT IS POSSIBLE THAT THE COMMUNITY WHERE THE LANDFILL FACILITY IS LOCATED MAY BE HESITANT TO ACCEPT MATERIALS, EVEN THOUGH TREATED, FROM A SUPERFUND SITE. FURTHER, DISPOSAL AT A MUNICIPAL FACILITY WOULD REQUIRE EXTENSIVE TRUCK TRAFFIC DURING TRANSPORTATION. CONVERSELY, THE USE OF ALCYON RACETRACK AS A PLACEMENT LOCATION WOULD NOT REQUIRE TRUCK TRAFFIC IN PITMAN OR IN THE SURROUNDING COMMUNITIES.

(E) DISPOSAL AT MONTGOMERY COUNTY SUBURBAN LANDFILL OF TREATED MATERIALS.

THE SAME ADVANTAGES AND DISADVANTAGES APPLY TO THIS OPTION AS EXISTS FOR THE GLOUCESTER COUNTY MUNICIPAL LANDFILL.

THE PLACEMENT OF TREATED MATERIAL BACK INTO ALCYON LAKE WAS REJECTED IN THE FS BECAUSE OF CONCERNS OVER BLOCKING ARTESIAN SPRINGS ORIGINATING IN THE KIRKWOOD AQUIFER. THE INCREASE IN FLOW TO ALCYON LAKE PROVIDED BY THESE SPRINGS WILL ASSIST IN ATTAINING THE GOAL OF MAINTAINING FISHABLE/SWIMMABLE WATER QUALITY IN ALCYON LAKE. FUTHERMORE, METALS ARE NOT EXPECTED TO BE SIGNIFICANTLY AFFECTED BY THE TREATMENT PROCESS. AT PRESENT, THERE ARE NO PROMULGATED STANDARDS OR GUIDELINES TO ADDRESS CONTAMINANT CONCENTRATIONS IN SEDIMENTS. HOWEVER, IT IS ACCEPTED SCIENTIFIC KNOWLEDGE THAT MANY CONTAMINANTS, ESPECIALLY METALS, ARE SIGNIFICANTLY MORE MOBILE IN A SEDIMENT/WATER INTERFACE THAN ARE METALS IN A SOIL THAT IS NOT IN CONTACT WITH GROUND WATER. DAILY FLUCTUATIONS IN THE PH OF AQUATIC SYSTEMS, AS WELL AS THE ACTIVITY OF BENTHIC ORGANISMS, LEAD TO INCREASES IN THE DISSOLUTION OF METALS FROM SEDIMENTS TO THE AQUEOUS PHASE. THE ALTERNATIVES THAT UTILIZE TREATMENT AND PLACEMENT OF TREATED SOILS AND SEDIMENTS IN NON-AQUEOUS ENVIRONMENTS WILL PROVIDE BETTER ASSURANCES OF MAINTAINING SURFACE WATER QUALITY.

#SCAA
SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

THE PREVIOUSLY DISCUSSED ALTERNATIVES WERE EVALUATED USING EVALUATION CRITERIA DERIVED FROM THE NCP AND THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986. THE CRITERIA RELATE DIRECTLY TO FACTORS MANDATED BY SARA IN SECTION 121, INCLUDING SECTION 121(B)(1)(A-G) AND EPA INTERIM GUIDANCE ON SELECTION OF REMEDY (DECEMBER 24, 1986 AND JULY 24, 1987). THE CRITERIA ARE AS FOLLOWS:

COMPLIANCE WITH LEGALLY APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

REDUCTION OF TOXICITY, MOBILITY OR VOLUME

SHORT-TERM EFFECTIVENESS

LONG-TERM EFFECTIVENESS

IMPLEMENTABILITY

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

COMMUNITY ACCEPTANCE

STATE ACCEPTANCE

COST

A SUMMARY OF THE DISCUSSION OF THESE CRITERIA, WITH THE EXCEPTION OF STATE ACCEPTANCE, IS CONTAINED IN TABLE 8. DUE TO THE HIGH LEVEL OF AGREEMENT BETWEEN EPA AND NJDEP ON THE PROPOSED REMEDIAL ACTIONS IN THE OFF-SITE AREAS, A SEPARATE COLUMN WAS NOT PRESENTED IN THE SUMMARY. THE CRITERIA OF PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT WAS DIVIDED INTO TWO COLUMNS TO MORE FULLY DESCRIBE THESE TWO IMPORTANT AREAS. A DISCUSSION OF THE OBJECTIVES OF THE NINE EVALUATION CRITERIA IS PROVIDED BELOW.

COMPLIANCE WITHARARS

SECTION 121(D) OF CERCLA, AS AMENDED BY SARA, REQUIRES THAT REMEDIAL ACTIONS COMPLY WITH ALL APPLICABLE OR RELEVANT AND APPROPRIATE FEDERAL AND STATE REQUIREMENTS FOR THE HAZARDOUS SUBSTANCES, POLLUTANTS, OR CONTAMINANTS THAT ARE PRESENT AND ATTRIBUTABLE TO A SITE. THE CONTAMINATED SOILS AND SEDIMENTS IN THE OFF-SITE AREAS ARE IMPACTING THE QUALITY OF WATER IN CONTACT WITH THE SOILS OF CHESTNUT BRANCH MARSH AND THE SEDIMENTS OF RABBIT RUN, CHESTNUT BRANCH STREAM AND ALCYON LAKE. AS SUCH, CLEANUP OF THESE AREAS IS NECESSARY TO ACHIEVE WATER QUALITY ARARS. THE SAME RATIONALE APPLIES TO THE MARSH GROUND WATER COLLECTION SYSTEM. THE ALTERNATIVES THAT UTILIZE TREATMENT AND PLACEMENT OF TREATED SOILS AND SEDIMENTS IN NON-AQUEOUS ENVIRONMENTS WILL PROVIDE BETTER ASSURANCES TO MAINTAINING SURFACE WATER QUALITY. THESE INCLUDES ALTERNATIVES 7B, 9B, 12A, 12B, 14A, 14B, 18A, AND 18B.

CONTAMINANTS IN MARSH SOILS OUTSIDE OF THE SLURRY WALL SERVE AS A RESERVOIR FOR FUTURE CONTAMINANT MIGRATION TO ADJACENT SURFACE WATERS. COLLECTION OF GROUND WATER IN THE MARSH WILL INTERCEPT THESE CONTAMINANTS AS WELL AS ANY POTENTIAL MIGRATION OF CONTAMINANTS IN GROUND WATER THAT MAY OCCUR AS A RESULT OF THE ON-SITE FLUSHING ACTIVITIES. ALTERNATIVE 2A AND 2B PROVIDE THE BEST ASSURANCES OF CAPTURING LEACHATE IN THE MARSH, AND IN MEETING THE INTENT OF THE SEPTEMBER 30, 1985 ROD. THE MARSH COLLECTION SYSTEM WILL BE PLACED AS CLOSE TO THE SLURRY WALL AS POSSIBLE WITHIN THE LIMITS OF CONSTRUCTION TECHNOLOGY. SOIL EAST AND NORTH OF THE COLLECTION SYSTEM IN THE MARSH WILL BE EXCAVATED AND THERMALLY TREATED TO REMOVE ORGANIC CONTAMINANTS THAT ARE PRESENTLY AFFECTING WATER QUALITY IN DOWNSTREAM RECEIVING WATERS. THE ROTARY DRIER TECHNOLOGY WILL RESULT IN THE REMOVAL OF ORGANIC CONTAMINANTS FROM THE MARSH SOILS. IN ORDER TO AVOID CREATING AN AIR EMISSION PROBLEM, VAPOR CONTROLS SHALL BE UTILIZED IN ORDER TO MEET, AT A MINIMUM, NJDEP AIR EMISSION STANDARDS (NJAC TITLE 7, CHAPTER 27, SUBCHAPTER 17). SPECIFIC TECHNOLOGICAL CONSIDERATIONS SUCH AS RETENTION TIME, OPERATING TEMPERATURES, AND OPTIMUM VAPOR COLLECTION TECHNOLOGIES WILL BE DETERMINED DURING THE REMEDIAL DESIGN.

GROUND WATER EXTRACTION FROM THE KIRKWOOD AQUIFER (ALTERNATIVE 16) IS ALSO BEING UNDERTAKEN TO PROTECT SURFACE WATER QUALITY AND TO MEET THE INTENT OF THE SEPTEMBER 30, 1985 ROD. IN NEW JERSEY, THE KIRKWOOD AQUIFER IS CLASSIFIED AS A GW-2 DRINKING WATER AQUIFER. IN THE IMMEDIATE VICINITY OF THE LIPARI LANDFILL SITE, THE KIRKWOOD IS NOT UTILIZED AS A DRINKING WATER SOURCE. DUE TO THE POOR YIELD OF THE FORMATION (OFF-SITE RI, PHASES 1 AND 2) AND THE ABUNDANCE OF HIGH YEILD AQUIFERS IN THE LOCAL AREA, IT IS UNLIKELY THAT THE KIRKWOOD AQUIFER IN THE SITE VICINITY WOULD BE UTILIZED AS A DRINKING WATER SOURCE IN THE FUTURE. THE AREA OF CONTAMINATION IN THE KIRKWOOD IS CONFINED TO THE UPPER PORTION OF THE FORMATION. THE KIRKWOOD HAS BEEN CHARACTERIZED AS FLOWING UPWARDS INTO CHESTNUT BRANCH STREAM, WITH THIS SURFACE WATER STREAM ACTING AS THE DISCHARGE POINT AND HYDROLOGIC BOUNDARY FOR CONTAMINANT MIGRATION IN THE KIRKWOOD AQUIFER. FOR THESE REASONS, IN THIS UNIQUE SITUATION, THE APPLICATION OF SURFACE WATER STANDARDS SHOULD BE APPLIED TO CLEANUP GOALS FOR THE KIRKWOOD AQUIFER. CHESTNUT BRANCH AND ALCYON LAKE ARE CLASSIFIED AS FW2-NT. THE SURFACE WATER QUALITY CRITERIA FOR THIS CLASSIFICATION ARE LISTED IN TABLE 6. FOR THOSE COMPOUNDS, SUCH AS BIS(2-CHLORETHYL)ETHER THAT ARE NOT LISTED IN THE FW2-NT CLASSIFICATION, FEDERAL WATER QUALITY CRITERIA ESTABLISHED UNDER THE CLEAN WATER ACT SHOULD BE APPLIED AS A GUIDELINE FOR CLEANUP GOALS. A CHEMICAL-SPECIFIC LIST OF COMPOUNDS DETECTED IN THE KIRKWOOD AQUIFER AND CORRESPONDING FEDERAL WATER QUALITY

CRITERIA ARE LISTED IN TABLE 6.

THE NEED FOR ADDITIONAL EXTRACTION WELLS TO BEST ENSURE THAT CONTAMINANTS PRESENT IN THE KIRKWOOD AQUIFER ARE REMOVED IN RDER TO MINIMIZE IMPACT ON SURFACE WATER QUALITY WILL BE DETERMINED DURING REMEDIAL DESIGN. THE EXTRACTION AND TREATMENT OF GROUND WATER FROM THIS FORMATION SHOULD CONTINUE, AT A MINIMUM, FOR THE DURATION OF THE ON-SITE FLUSHING. THE SPECIFIC RATE OF FLUSHING AND ANY ALLOWABLE RESIDUAL CONCENTRATION OF CONTAMINANTS WILL BE INCORPORATED INTO THE MONITORING PLAN AND WILL REFLECT SURFACE WATER QUALITY CRITERIA. A SIMILAR APPROACH WILL BE TAKEN WITH RESPECT TO THE COLLECTION OF LEACHATE IN THE MARSH AREA.

THE PLACEMENT OF TREATED SOILS AND SEDIMENTS AT THE ALCYON RACETRACK WOULD NOT EXCEED CURRENT RCRA GUIDELINES CONCERNING THE DISPOSAL OF TREATED MATERIALS. SOILS AND SEDIMENTS HAVE BEEN EXAMINED USING THE EXTRACTION PROCEDURE TOXICITY (EP-TOX) TEST FOR METALS AND PESTICIDES. THE TESTED MATERIALS HAVE NOT EXHIBITED HAZARDOUS CHARACTERISTICS ASSOCIATED WITH THE EP-TOX PROCEDURE AND HAVE NOT BEEN CLASSIFIED AS A LISTED WASTE, THEREFORE, ARE NOT CONSIDERED TO BE A RCRA WASTE. IN ADDITION TO THE EP-TOX PROCEDURE, THE TOXIC CHARACTERISTICS LEACHING PROCEDURE (TCLP) WHICH INCLUDES AN ANALYSIS FOR ORGANIC COMPOUNDS HAS BEEN DEVELOPED TO FURTHER DEFINE LEACHING CHARACTERISTICS. THE EP-TOX PROCEDURE WILL BE USED ON TREATED MATERIALS DURING REMEDIATION TO ENSURE A LEVEL OF TREATMENT THAT IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. ADDITIONAL TESTS SUCH AS THE TCLP TEST WILL BE UTILIZED AS NEEDED TO ENSURE THAT EFFECTIVE TREATMENT THAT IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT IS ACHIEVED.

REDUCTION OF TOXICITY, MOBILITY OR VOLUME

THIS EVALUATION CRITERIA INVOLVES THE PERFORMANCE OF A TECHNOLOGY OR REMEDIAL ALTERNATIVE IN TERMS OF ELIMINATING OR CONTROLLING RISKS POSED BY THE TOXICITY, MOBILITY OR VOLUME (TMV) OF HAZARDOUS SUBSTANCES. THE ABILITY OF EACH ALTERNATIVE TO ATTAIN THIS CRITERIA IS SUMMARIZED IN TABLE 9. ALTERNATIVES THAT UTILIZE TREATMENT PROVIDE THE BEST ASSURANCES THAT A REDUCTION IN TMV WILL BE ACHIEVED. OFF-SITE COLLECTION WILL REDUCE THE MOBILITY OF CONTAMINANTS IN THE GROUND WATER, ON-SITE TREATMENT WILL REDUCE TOXICITY AND VOLUME. FOR THE MARSH, ALTERNATIVES 2A AND 2B PROVIDE THE BEST ASSURANCES THAT TMV WILL BE REDUCED. ALTERNATIVE 2B WILL REDUCE THE AMOUNT OF CLEAN WATER INFILTRATION TO THE TRENCH, THEREBY REDUCING THE TOTAL VOLUME OF COLLECTED MATERIAL TO BE TREATED. ALTERNATIVES 9B, 12B, 14B, AND 18B PROVIDE THE BEST ASSURANCES FOR TMV REDUCTION IN THE MARSH, STREAMS AND LAKE. THESE ALTERNATIVES ALL UTILIZE TREATMENT TECHNOLOGIES. EXCAVATION AND RCRA DISPOSAL DOES NOT AFFECT THE TOXICITY OR VOLUME; TREATMENT FOLLOWED BY REPLACEMENT IN ORIGINAL AREAS DOES NOT AFFECT THE MOBILITY OF METALS.

SHORT TERM EFFECTIVENESS

THE SHORT-TERM EFFECTIVENESS CRITERIA MEASURES HOW WELL AN ALTERNATIVE IS EXPECTED TO PERFORM, THE TIME TO ACHIEVE PERFORMANCE, AND THE POTENTIAL ADVERSE IMPACTS OF ITS IMPLEMENTATION. ALTERNATIVES THAT UTILIZE EXCAVATION AND/OR EXCAVATION AND TREATMENT HAVE AN INCREASED POTENTIAL FOR SHORT-TERM ADVERSE IMPACTS ASSOCIATED WITH SHORT-TERM EXPOSURE TO CONTAMINANT RELEASES. THIS INCLUDES ALTERNATIVES 6 THROUGH 10 (A AND B), ALTERNATIVES 12 A AND B, 14 A AND B, AND 18 A AND B. THE SHORT-TERM IMPACTS OF THE ALTERNATIVES ARE SUMMARIZED IN TABLE 9. THESE IMPACTS CAN BE MITIGATED THROUGH PROPER HEALTH AND SAFETY CONTROLS.

LONG TERM EFFECTIVENESS AND PERMANENCE

LONG-TERM EFFECTIVENESS AND PERMANENCE ADDRESSES THE LONG-TERM PROTECTION AND RELIABILITY OF AN ALTERNATIVE. THE EVALUATION OF THE ALTERNATIVES UNDER THIS CRITERIA IS PRESENTED IN TABLE 9. THE REMOVAL AND TREATMENT OF CONTAMINATED SOILS AND SEDIMENTS WILL ENSURE THAT WATER QUALITY AND AIR QUALITY GOALS ARE MET. ALTERNATIVES 9B, 10B, 12B, 14B, AND 18B ACHIEVE THESE GOALS. ALTERNATIVES 2B AND 16 WILL PROVIDE ASSURANCES THAT CONTAMINATED GROUND WATER DOES NOT IMPACT LOCAL SURFACE WATERS. SPECIFIC ENGINEERING CONSIDERATIONS OF THE ROTARY KILN TECHNOLOGY SUCH AS OPERATING TEMPERATURE, RETENTION TIME, AND OFF-GAS TREATMENT WILL BE DETERMINED DURING THE REMEDIAL DESIGN. OPTIMIZATION OF THESE PARAMETERS TO MAXIMIZE THE REMOVAL OF CONTAMINANTS COUPLED WITH PROPER SOIL ENGINEERING PRACTICES WILL ENSURE THAT THE PLACEMENT OF TREATED MATERIALS AT THE ALCYON RACETRACK WILL NOT REQUIRE FUTURE MONITORING AND WILL RESULT IN A PERMANENT REMEDY. AS DESCRIBED PREVIOUSLY AND SHOWN IN TABLE 8, RESIDUAL METALS ARE NOT EXPECTED TO POSE A HUMAN HEALTH OR ENVIRONMENTAL CONCERN.

IMPLEMENTABILITY

IMPLEMENTABILITY ADDRESSES HOW EASY OR DIFFICULT, FEASIBLE OR INFEASIBLE, IT WOULD BE TO CARRY OUT A GIVEN ALTERNATIVE. THIS COVERS IMPLEMENTATION FROM DESIGN THROUGH CONSTRUCTION AND OPERATION AND MAINTENANCE. THE IMPLEMENTABILITY OF THE ALTERNATIVE IS EVALUATED IN TERMS OF TECHNICAL AND ADMINISTRATIVE FEASIBILITY, AND AVAILABILITY OF NEEDED GOODS AND SERVICES. ALL ALTERNATIVES HAVE RESOURCE REQUIREMENTS WITH THE EXCEPTION OF THE NO ACTION ALTERNATIVES (4, 11, 13, 15, AND 17). ALL ACTIONS UTILIZE RESOURCES THAT HAVE BEEN IMPLEMENTED WITH AVAILABLE, PROVEN TECHNOLOGIES. THE SUMMARY OF THE EVALUATION OF THE ALTERNATIVES UNDER THIS CRITERIA IS PRESENTED IN TABLE 9.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT IS THE CENTRAL MANDATE OF CERCLA AS AMENDED BY SARA. PROTECTION IS ACHIEVED BY TAKING APPROPRIATE ACTIONS TO ENSURE THAT THERE WILL BE NO UNACCEPTABLE RISKS TO HUMAN HEALTH AND THE ENVIRONMENT THROUGH ANY EXPOSURE PATHWAYS.

THE EXCAVATION, DREDGING, DEWATERING, THERMAL TREATMENT (ALTERNATIVES 2B, 9B, 10B, 12B, 14B, 16 AND 18B), AND FINAL PLACEMENT OF TREATED MATERIALS AT THE ALCYON RACETRACK COUPLED WITH THE ON-SITE FLUSHING/LEACHATE COLLECTION AND TREATMENT ACTION WILL ENSURE THAT THE EXISTING OFF-SITE CONTAMINATION FROM THE LIPARI LANDFILL IS PERMANENTLY REMOVED FROM THE ENVIRONMENT AND THAT NO FUTURE OFF-SITE CONTAMINANT MIGRATION OCCURS.

CONTAMINATED SOILS AND SEDIMENTS IN THE OFF-SITE AREAS PASSED THE EP-TOX TEST AND, THEREFORE, ARE NOT CONSIDERED TO EXHIBIT ADVERSE LEACHING CHARACTERISTICS RELATIVE TO METALS AND PESTICIDES. MATERIAL AS IT IS PROCESSED WILL BE ANALYZED USING THE EP-TOX TEST FOR LEACHING CHARACTERISTICS AND OTHER TESTS SUCH AS THE TCLP TEST, WHICH INCLUDES ANALYSES FOR VOLATILE ORGANICS, AS NEEDED. TARGET COMPOUND LIST (TCL) ANALYSES FOR INDIVIDUAL HAZARDOUS COMPOUNDS WILL ALSO BE PERFORMED DURING TREATMENT TO ENSURE THAT THE TREATED MATERIALS CONFORM WITH ACCEPTABLE ENVIRONMENTAL GUIDELINES SUCH AS THOSE ESTABLISHED BY THE STATE OF NEW JERSEY FOR SOIL CLEANUP.

THE IMPACTS ON THE HEALTH AND SAFETY OF WORKERS AND NEARBY RESIDENTS WILL BE CLOSELY MONITORED DURING REMEDIAL ACTIONS. EXCAVATION IN THE CHESTNUT BRANCH MARSH IS LIKELY TO CAUSE THE MOST SIGNIFICANT ENVIRONMENTAL AND HUMAN HEALTH CONCERNS DUE TO THE POTENTIAL FOR CONTACT WITH CONTAMINATED SOIL BY WORKERS, INHALATION OF HAZARDOUS VOLATILE ORGANICS DURING EXCAVATION, AND TRANSPORT OF CONTAMINATED SEDIMENTS TO DOWNSTREAM RECEIVING WATERS.

APPROPRIATE MEASURES WOULD NEED TO BE TAKEN DURING EXCAVATION OF THE MARSH SOILS TO PROTECT WORKERS AND NEARBY RESIDENTS. AMONG THE CANDIDATE POSSIBILITIES FOR REDUCING VOLATILE EMISSIONS AND IMPROVING CONSTRUCTION CONDITIONS ARE THE FOLLOWING;

LOWERING OF THE GROUND WATER TABLE IN THE IMMEDIATE VICINITY. THIS MAY BE ACCOMPLISHED BY ONE OR MORE OF THE FOLLOWING METHODS: DEWATERING THE CONTAINMENT SYSTEM; PUMPING FROM WELL POINTS IN THE COHANSEY; PUMPING FROM WELL POINTS IN THE KIRKWOOD, TEMPORARILY REROUTING CHESTNUT BRANCH AND/OR RABBIT RUN.

THE USE OF VAPOR SUPPRESSANT TECHNOLOGIES SUCH AS VAPOR SUPPRESSANT FOAM AND PORTABLE INFLATABLE WORKTENTS.

THE WORKERS AND RESIDENTS WOULD BE PROTECTED THROUGH MEASURES OUTLINED IN PROJECT-SPECIFIC HEALTH AND SAFETY PLANS AND THROUGH CONTRACTOR ADHERANCE TO OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA) REGULATIONS. STRICT AIR MONITORING AT THE CONSTRUCTION SITE AS WELL AS IN THE NEARBY RESIDENTIAL AREAS WOULD NEED TO BE IMPLEMENTED. NOISE ASSOCIATED WITH THE ROTARY DRIER UNIT MAY NEED TO BE MITIGATED THROUGH NOISE SUPPRESSANT HOUSING OR INSULATION. IT IS NOT ANTICIPATED THAT ANY SUCH NOISE WOULD BE NOTICIBLE EXCEPT POSSIBLY DURING NIGHT-TIME OPERATION, IF NIGHT-TIME OPERATION IS ACCEPTABLE TO THE LOCAL COMMUNITY. DUST AND PARTICULATE MATTER ARE NOT EXPECTED TO BE A CONCERN DUE TO THE DAMP NATURE OF THE MARSH SOILS AND THE LAKE AND STREAM SEDIMENTS.

THE DISTURBANCE OF SOILS DURING MARSH EXCAVATION AND SEDIMENTS DURING DREDGING WILL LIKELY RESULT IN AN INCREASE IN SUSPENDED SEDIMENTS THAT MAY CARRY CONTAMINANTS INTO THE LOCAL SURFACE WATERS. REROUTING OF STREAMS, THE USE OF SILT CURTAINS, AND LIMITING THE FLOW OF WATER AT THE ALCYON LAKE SPILLWAY WOULD ALL RESULT IN A MINIMIZATION OF THE TRANSPORT OF SUSPENDED SOLIDS IN LOCAL SURFACE WATERS.

COMMUNITY ACCEPTANCE

THIS EVALUATION CRITERION ADDRESSES THE DEGREE TO WHICH MEMBERS OF THE LOCAL COMMUNITY SUPPORT THE REMEDIAL ALTERNATIVES BEING EVALUATED.

THE COMMUNITY HAS SHOWN A GREAT DEAL OF SUPPORT FOR THE PROPOSED OFF-SITE CLEANUP. THE MAYOR AND THE TOWN COUNCIL OF THE BOROUGH OF PITMAN MOVED TO PURCHASE THE ALCYON RACETRACK IN ORDER TO EXPEDITE THE OFF-SITE CLEANUP ACTION. THE BOROUGH ALREADY OWNED THE ADJACENT PARK AND HAD DEBATED PURCHASING THE RACETRACK AND ADJOINING WOODS FOR SEVERAL MONTHS. BY PURCHASING THAT PROPERTY, PITMAN HAS ASSURED THAT:

(1) LAND FOR PLACEMENT OF TREATED MATERIALS WILL BE AVAILABLE;

(2) A COMPLETE STAGING AND DISPOSAL AREA IS REMOVED FROM RESIDENTIAL AREAS;

(3) TRUCK TRANSPORTATION TRAFFIC WILL NOT IMPACT THE LOCAL COMMUNITIES; AND

(4) REMEDIATION CAN BE PERFORMED AT A RELATIVELY LOW COST.

MR. DOUGLAS ZEE OWNS THE PROPERTY (ORCHARDS) BETWEEN THE LANDFILL AND THE RACETRACK. DISCUSSIONS WITH MR. ZEE INDICATE THAT HE IS WILLING TO ALLOW TRUCK ACCESS TO ROADS ON HIS PROPERTY BETWEEN THE LIPARI LANDFILL AND THE RACETRACK. THE COMPLETION OF A FORMAL ACCESS AND EASEMENT AGREEMENT WITH MR. ZEE WOULD ENSURE THAT TRUCK TRAFFIC IMPACT IN THE COMMUNITY IS KEPT TO A MINIMUM. EXISTING ROADS ARE SHOWN IN FIGURE 1. THE SPECIFIC CONCERNS OF THE COMMUNITY WITH REGARD TO THE REMEDIAL ACTIVITIES INCLUDE, SUPPRESSION OF VOLATILE EMISSIONS DURING EXCAVATION AND DREDGING, NOISE ASSOCIATED WITH THE ROTARY DRIER, OFF-GAS COLLECTION/TREATMENT OF CONTAMINANTS FROM THE ROTARY DRIER, TESTING OF TREATED MATERIALS DURING AND AFTER TREATMENT TO ASSURE EFFECTIVENESS OF THE TREATMENT, POTENTIAL PUBLIC HEALTH AND ENVIRONMENTAL IMPACTS ASSOCIATED WITH RESIDUALS IN TREATED MATERIALS, FINAL AESTHETIC APPEARANCE OF THE RACETRACK AREA, AND USE RESTRICTIONS ON THE RACETRACK AREA. DETAILED RESPONSES TO THE COMMUNITY CONCERNS ARE CONTAINED IN THE RESPONSIVNESS SUMMARY (ATTACHMENT F).

A COROLLARY ISSUE ASSOCIATED WITH THE IMPACT OF THE LIPARI LAND-FILL ON ALCYON LAKE IS THE NEED FOR A WATERSHED MANAGEMENT PLAN TO ADDRESS OTHER POINT AND NON-POINT SOURCES OF POLLUTION WHICH MAY IMPACT THE LAKE. EFFORTS ARE UNDERWAY TO INTEGRATE THE OFF-SITE REMEDIATION WITH THE GOALS OF A COMPREHENSIVE WATERSHED MANAGEMENT PLAN.

COST

COSTS ARE EVALUATED IN TERMS OF CAPITAL COSTS, OPERATION AND MAINTENCE COSTS, AND PRESENT WORTH COSTS. THESE ITEMS ARE INCLUDED IN TABLE 9. THE COSTS ASSOCIATED WITH THE PREFERED OFF-SITE REMEDIATION OF ALCYON LAKE, RABBIT RUN AND CHESTNUT BRANCH STREAM REPRESENT THE LOWEST COSTS FOR THE REMEDIATION OF THESE AREAS. THIS IS SIGNIFICANT IN THAT THE PREFERED ALTERNATIVES ALSO INVOLVE TREATMENT TO ACHIEVE A PERMANENT REMEDY. THE COST ASSOCIATED WITH REMEDIATING CHESTNUT BRANCH MARSH IS NOT THE LOWEST, HOWEVER, IT DOES PROVIDE THE GREATEST ASSURANCE FOR PROTECTION OF PUBLIC HEALTH AND THE ENVIRONMENT.

THE COLLECTION OF LEACHATE (ALTERNATIVES 2B AND 16) ADDRESSES THE REQUIREMENTS OF THE SEPTEMBER 30, 1985 ROD. ALTERNATIVE 16 WILL UTILIZE THE EXISTING WELLS TO THE EXTENT THAT IT IS FEASIBLE (A PUMPING NETWORK WILL BE REQUIRED AND THE NEED FOR ADDITIONAL WELLS WILL BE EVALUATED DURING THE REMEDIAL DESIGN) AS WELL AS THE ON-SITE TREATMENT FACILITY. COSTS ASSOCIATED WITH THIS OPTION PRIMARILY INVOLVE OPERATION AND MAINTENANCE. COLLECTION OF LEACHATE IN THE MARSH AREA, ALTERNATIVE 2B, IS NOT THE LEAST EXPENSIVE ALTERNATIVE FOR COLLECTION OF SEEPAGE IN THE MARSH. HOWEVER, IT DOES PROVIDE THE GREATEST DEGREE OF PUBLIC HEALTH AND ENVIRONMENTAL PROTECTION AND, FURTHER, HAS THE LOWEST OPERATION AND MAINTENANCE COSTS. THE RANGE OF COSTS ASSOCIATED WITH ALTERNATIVES 1, 2A, 2B, AND 3 VARY BY LESS THAN 10 PERCENT ($5,788,000 TO $6,365,000). TABLE 10 SHOWS THE COSTS ASSOCIATED WITH THE PREFERRED ALTERNATIVES, AND THE RANGE ASSOCIATED WITH OTHER CANDIDATE ALTERNATIVES FOR THE SAME OPERABLE UNIT.

#SR
SELECTED REMEDY

THROUGH THE COMPARATIVE ANALYSIS DESCRIBED IN THE PRECEEDING SECTION AND AS OUTLINED IN TABLE 9 AND IN THE OFF-SITE FS, THE REMEDY THAT HAS BEEN SELECTED WHICH PROVIDES THE BEST BALANCE AMONG THE CRITERIA AND SATISFIES THE STATUTORY REQUIREMENTS OF SECTION 121 OF CERCLA, AS AMENDED, IS A COMBINATION OF ALTERNATIVES 2B, 9B (OPTION 2) 12B, 14B, 16, 18B, AND 19 WITH PLACEMENT OF TREATED MATERIALS AT THE ALCYON RACETRACK. THE OFF-SITE COLLECTION SYSTEM (ALTERNATIVES 2B AND 16) WILL ENSURE THAT CONTAMINATED GROUND WATER IN THE COHANSEY AND KIRKWOOD AQUIFERS DOES NOT DISCHARGE INTO CHESTNUT BRANCH STREAM. THESE ACTIONS WILL ENSURE THAT SURFACE WATER CRITERIA UNDER THE CLEAN WATER ACT AND NEW JERSEY SURFACE WATER STANDARDS ARE ACHIEVED. ALTERNATIVE 9B WILL ENSURE THAT CONTAMINANTS PRESENT IN THE CHESTNUT BRANCH MARSH DO NOT CONTINUE TO MIGRATE AND IMPACT LOCAL SURFACE WATERS AND SEDIMENTS. EXPOSURE ROUTES FOR AIR INHALATION AND SOIL CONTACT CHARACTERIZED AS POSING POTENTIAL LONG-TERM HUMAN HEALTH THREATS WILL ALSO BE ELIMINATED. ALTERNATIVE 12B WILL REMOVE AND TREAT CONTAMINATED SEDIMENTS THAT CONTAIN CONTAMINANTS PRESENT IN THE WATER COLUMN OF THE LAKE AT LEVELS THAT EXCEED FWQC. ADDITIONALLY, BCEE HAS BEEN DETECTED IN FISH TISSUE FROM THE FISH OF ALCYON LAKE. INGESTION OF FISH FROM THE LAKE WAS CHARACTERIZED AS AN EXPOSURE PATHWAY ASSOCIATED WITH A LONG-TERM HUMAN HEALTH THREAT. APPROPRIATE SAMPLING AND ANY NECESSARY REMOVAL, RELOCATION, AND/OR RESTOCKING OF AQUATIC WILDLIFE WILL BE MADE PRIOR TO LAKE REMEDIATION. ALTERNATIVES 14B AND 18B WILL REMOVE AND TREAT CONTAMINATED SEDIMENTS IN RABBIT RUN AND CHESTNUT BRANCH STREAM THAT CONTAIN CONTAMINANTS PRESENT IN THE WATER COLUMN AT LEVELS THAT EXCEED SURFACE WATER CRITERIA AND STANDARDS. ALL OF THE DOWNSTREAM AND DOWNGRADIENT AREAS HAVE BEEN SHOWN TO CONTAIN ELEVATED LEVELS OF LIPARI RELATED CONTAMINANTS.

THE USE OF THE ALCYON RACETRACK AS AN AREA TO PLACE TREATED, NON-HAZARDOUS MATERIAL WILL BE IN COMPLIANCE WITH ARARS, PROVIDE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT, IS EASILY IMPLEMENTED, WILL PROVIDE LONG-TERM EFFECTIVENESS, AND HAS THE SUPPORT OF THE LOCAL COMMUNITY. AT PRESENT, THE ONLY GUIDELINES AVAILABLE FOR SOILS ARE NEW JERSEY SOIL CLEANUP OBJECTIVES. AS DISCUSSED EARLIER, TREATED MATERIAL IS EXPECTED TO BE WITHIN THE GUIDELINES OF THOSE OBJECTIVES. DURING REMEDIAL DESIGN ACTIVITIES THE DETERMINATION OF SITE-SPECIFIC INFORMATION SUCH AS SOIL PROPERTIES AND DEPTH TO GROUND WATER WILL BE INCORPORATED INTO A DETERMINATION OF MINIMUM SITE SPECIFIC CLEANUP LEVELS FOR SOILS AND SEDIMENTS PRIOR TO THEIR PLACEMENT AT THE RACETRACK. THE LEVELS THAT WILL BE SET WILL ENSURE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. THE ESTIMATED COST ASSOCIATED WITH THE SELECTED REMEDY IS $21 MILLION (TABLE 10).

#SFS
STATUTORY FINDINGS/SUMMARY

THE SELECTED REMEDY SATISFIES THE NINE EVALUATION CRITERIA TO THE GREATEST DEGREE OF THE ALTERNATIVES EXAMINED.

THE AGENCY HAS BEEN EXPLICITLY DIRECTED BY CONGRESS IN SECTION 121(B) OF CERCLA, AS AMENDED, TO SELECT REMEDIAL ACTIONS WHICH UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY OPTIONS TO THE MAXIMUM EXTENT PRACTICABLE. IN ADDITION, THE AGENCY IS TO PREFER REMEDIAL ACTIONS THAT PERMANENTLY AND SIGNIFICANTLY REDUCE THE MOBILITY, TOXICITY OR VOLUME OF SITE WASTES. APPLYING THIS STATUTORY PREFERENCE HERE, ALTERNATIVES 9B, 12B, 14B AND 18B PROVIDE THE GREATEST DEGREE OF LONG-TERM EFFECTIVENESS AND PERMANENCE BY UTILIZING A TREATMENT TECHNOLOGY THAT WILL PERMANENTLY REMOVE ORGANIC CONTAMINANTS ATTRIBUTABLE TO THE LIPARI LANDFILL IN THE OFF-SITE AREAS. IN ADDITION, EXCAVATION AND DREDGING WILL ALSO FULFILL THE PREFERENCE FOR PERMANENT ELIMINATION OR REDUCTION OF THE PUBLIC HEALTH AND ENVIRONMENTAL RISK. BECAUSE OF THE POTENTIAL MOBILITY OF THE CONTAMINANTS IN SEDIMENTS AND THE BIOACCUMULATION IN FISH, THIS PERMANENT SOLUTION IS APPROPRIATE. THERE WOULD BE VIRTUALLY NO RESIDUAL RISK ASSOCIATED WITH THIS ALTERNATIVE SINCE THE ORGANIC CONTAMINANTS WOULD BE REMOVED THROUGH THE THERMAL TREATMENT PROCESS AND THE EXCAVATION AND DREDGING PLANS. ALSO, THERE WOULD BE NO NEED FOR EVENTUAL REPLACEMENT OF THE REMEDY SINCE THE RESIDUALS FROM THE TREATMENT PROCESS WILL BE NON-HAZARDOUS. FINALLY, THIS REMEDY IS RELIABLE AND WILL AVOID THE LONG-TERM UNCERTAINTIES ASSOCIATED WITH LAND DISPOSAL OF UNTREATED WASTES. HENCE, PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT ON A LONG-TERM PERMANENT BASIS IS BEST ASSURED BY THE SELECTED ACTIONS. THESE ACTIONS, COUPLED WITH LEACHATE COLLECTION AND TREATMENT IN THE COHANSEY AND KIRKWOOD AQUIFERS (ALTERNATIVES 2B AND 16), ENSURE THE PERMANENT ELIMINATION OF LIPARI RELATED CONTAMINANTS IN THE OFF-SITE ENVIRONMENT.

THE THERMAL TREATMENT PROCESS WOULD COMPLY WITH ALL ACTION SPECIFIC ARARS. IN ADDITION, THE RESIDUALS FROM THE THERMAL TREATMENT WOULD BE DETERMINED NON-HAZARDOUS AND WOULD NOT POSE A THREAT TO HUMAN HEALTH OR THE ENVIRONMENT THROUGH ANY EXPOSURE PATHWAY.

THE AGENCY BELIEVES THAT THE ROTARY KILN DRIER TECHNOLOGY IS AVAILABLE AND RELIABLE FOR THE TREATMENT OF CONTAMINATED SOILS AND SEDIMENTS EXISTING IN THE VICINITY OF THE LIPARI LANDFILL SITE. THIS TECHNOLOGY HAS BEEN SUCCESSFULLY IMPLEMENTED AT THE MCKIN SUPERFUND SITE IN GRAY, MAINE TO REMOVE VOLATILE ORGANICS AND PAHS (POLYAROMATIC HYDROCARBONS) FROM SOILS. THE LAND AREA IS AVAILABLE FOR THE SITING OF THE TREATMENT PROCESS UNITS AND PLACEMENT OF THE TREATED, NON-HAZARDOUS SOILS AND SEDIMENTS. PILOT TESTING OF THE EQUIPMENT WOULD BE UTILIZED TO ENSURE THE OPERATIONAL RELIABILITY OF THE UNIT ON SITE-SPECIFIC SOILS AND SEDIMENTS. ALTHOUGH THIS REMEDY WOULD REQUIRE MEASURES TO CONTROL POSSIBLE RISKS RELATED TO CONSTRUCTION AND OPERATION (E.G. AIR EMISSIONS), THE AGENCY'S ANALYSIS INDICATES THAT ALL OF THESE FACTORS CAN BE ADEQUATELY CONTROLLED.

THE CAPITAL COSTS FOR THERMAL TREATMENT OF THE SOILS AND SEDIMENTS FOLLOWED BY PLACEMENT AT THE ALCYON RACETRACK ARE LESS THAN THE COSTS ASSOCIATED WITH DISPOSAL (WITH OR WITHOUT TREATMENT) AT A MUNICIPAL OR RCRA FACILITY. FUTHERMORE, BECAUSE THE THERMAL TREATMENT PROCESS REPRESENTS A PERMANENT REMEDY, THERE WOULD BE NO LONG-TERM OPERATION AND MAINTENANCE COSTS ASSOCIATED WITH FUTURE MONITORING. WHILE THE SELECTION OF THE REMEDY INVOLVES THE BALANCING OF COSTS AND EFFECTIVENESS AGAINST THE RELATIVE BENEFITS OF EACH ALTERNATIVE, THE AGENCY IS STATUTORILY REQUIRED TO FAVOR REMEDIES THAT ARE PERMANENT AND THAT UTILIZE TREATMENT TECHNOLOGIES WHICH PERMANENTLY AND SIGNIFICANTLY REDUCE THE TOXICITY, MOBILITY OR VOLUME OF THE CONTAMINANTS.

THE SELECTED ACTIONS REPRESENT THE BEST BALANCE OF THE NINE EVALUATION CRITERIA AND ARE COST-EFFECTIVE, PERMANENT SOLUTIONS TO CONTAMINATION PROBLEMS EXISTING IN THE ENVIRONMENT.

THE COMMUNITY PREFERS THAT ALL OF THE CONTAMINATED SOILS AND SEDIMENTS IN THE OFF-SITE AREAS BE EXCAVATED/DREDGED AND TREATED TO PERMANENTLY REMOVE CONTAMINANTS. WHILE THERE HAS BEEN SOME LOCAL APPREHENSION AT PLACING THE NON-HAZARDOUS TREATED MATERIALS AT THE ALCYON RACETRACK, THE MAJORITY OF THE LOCAL CITIZENS AND ELECTED OFFICIALS STRONGLY FAVOR THIS OPTION. THE PRIMARY COMMUNITY CONCERNS TO BE ADDRESSED DURING REMEDIATION WILL BE NOISE, ODORS, AND VAPOR CONTROLS ASSOCIATED WITH THE REMEDIAL ACTIONS. IN ADDITION, DEMONSTRATION OF THE EFFECTIVENESS OF THE TREATMENT PROCESSS WOULD BE REQUIRED. RESTORATION OF THE RACETRACK AREA TO AN ACCEPTABLE AESTHETIC LEVEL WOULD ALSO BE REQUIRED.

THE SELECTED REMEDY WOULD BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT BY: 1) UTILIZING TREATMENT TO REDUCE TOXICITY AND MOBILITY OF THE WASTE; 2) BEING THE MOST EFFECTIVE AND PERMANENT SOLUTION IN THE LONG-TERM; 3) BEING RELATIVELY EASY TO IMPLEMENT; AND 4) ASSURING SHORT-TERM EFFECTIVENESS. FURTHERMORE, ALTENATIVES 2B AND 16 WOULD MEET THE INTENT OF THE SEPTEMBER 30, 1985 ROD RELATIVE TO LEACHATE COLLECTION.

IN SUMMARY, EPA HAS SELECTED ALTERNATIVES 2B, 9B, 12B, 14B, 16, 18B, AND 19 BECAUSE THEY ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, WILL ATTAIN ALL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, ARE COST-EFFECTIVE, AND UTILIZE PERMANENT SOLUTIONS AND TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY OPTIONS TO THE MAXIMUM EXTENT PRACTICABLE. ADDITIONALLY, SINCE THESE ALTERNATIVES EMPLOY THERMAL TREATMENT TO ELIMINATE THE PRINCIPAL THREAT AT THE SITE, THIS OPTION WOULD ALSO SATISFY SARA'S PREFERENCE FOR REMEDIES WHICH EMPLOY TREATMENT AS THEIR PRINCIPAL ELEMENT TO PERMANENTLY AND SIGNIFICANTLY REDUCE TOXICITY, MOBILITY OR VOLUME OF THE CONTAMINANTS.

#TA

TABLE 1

HISTORY OF INVESTIGATIONS FOR LIPARI LANDFILL OFF-SITE AREAS

DATE	ACTIVITY
5/71	LIPARI LANDFILL CLOSED.
9/78-6/79	ROSSNAGEL AND ASSOCIATES -- WATER QUALITY STUDY ON ALCYON LAKE -- SOIL, SEDIMENT AND SURFACE WATER SAMPLES COLLECTED AND ANALYZED.
1/79	NJ SOLID WASTE ADMINISTRATION -- SAMPLED AND ANALYZED LEACHATE FROM CHESTNUT BRANCH MARSH.
7/79-10/79	EPA SURVEILLANCE AND ANALYSIS/ TECHNICAL ASSISTANCE TEAM (TAT) -- LEACHATE, SURFACE WATER, SEDIMENT AND PRIVATE WELL SAMPLING AND ANALYSIS.
9/79	NJ INSTITUTE OF TECHNOLOGY AIR POLLUTION RESEARCH LABORATORY UNDER DIRECTION OF NJDEP -- AIR MONITORING SAMPLES FROM LEACHATE SEEP AREAS AND RESIDENTIAL PROPERTY.
9/79	NJ DEPARTMENT OF HEALTH -- LEACHATE SAMPLES COLLECTED AND ANALYZED FROM THE MARSH.
12/79	NJ DEPARTMENT OF FISH AND GAME UNDER DIRECTION OF NJ TOXIC SUBSTANCES PROGRAM -- FISH TISSUE ANALYSIS FROM ALCYON LAKE. EVALUATION OF DISCHARGES FROM THE NICK LIPARI LANDFILL, ROY F. WESTON INC., APRIL 1980, FOR THE ROHM AND HAAS COMPANY.
10/80	GLOUCESTER COUNTY PLANNING DEPARTMENT -- APPLICATION TO PERFORM DIAGNOSTIC AND FEASIBILITY STUDY UNDER THE FEDERAL CLEAN WATER ACT.
1980	GLOUCESTER COUNTY PLANNING DEPARTMENT -- ROSSNAGEL AND ASSOCIATES CONTRACTED TO PERFORM WATER QUALITY STUDIES ON ALCYON LAKE AND CHESTNUT BRANCH WATERSHED AREA. BIOTIC INVENTORY AND BIOASSAYS PERFORMED. MUNICIPAL WELLS, GROUND WATER, SOIL, SURFACE WATER, URBAN RUNOFF, AND AGRICULTURAL RUNOFF SAMPLES WERE COLLECTED AND ANALYZED.
1981	TAT SURVEY -- WEST OF CHESTNUT BRANCH -- CROSS SECTION PROFILES TO DEFINE STRATIGRAPHY IN THE MARSH.

TABLE 1
(CONTINUED)

12/81	EPA FIELD INVESTIGATION TEAM - FIT (FRED C. HART) SITE INVESTIGATION -- SURFACE WATER, SEDIMENT, SOIL, AND PRIVATE WELL SAMPLES ANALYZED.
7/82	RADIAN CORPORATION -- SURFACE WATER, SEDIMENT, AND BIOLOGICAL SAMPLES COLLECTED AND ANALYZED.
1983	RADIAN CORPORATION -- COMPLETED A TWO PHASE STUDY TO EVALUATE EFFECTS OF REMEDIAL ACTION ACTIVITIES AT LIPARI LANDFILL ON ALCYON LAKE.
7/84	NJ DIVISION OF WASTE MANAGEMENT -- CONDUCTED AIR QUALITY SURVEYS IN BASEMENTS OF RESIDENTS.
2/85-2/87	CAMP DRESSER & MCKEE REMEDIAL INVESTIGATION OF THE OFF-SITE AREAS -- SURFACE WATER, SEDIMENT, SOIL, LEACHATE, GROUND WATER, PRIVATE WELLS, MUNICIPAL WELLS, AND AIR SAMPLES COLLECTED AND ANALYZED.
6/86 9/86 10/87	TAGA STUDIES BY ERT & FIT CONTRACTORS FOR EPA.
3/88	EPA/ERT -- ENVIRONMENTAL SAMPLING OF SURFACE WATER AND SEDIMENTS TO ADDRESS NATURAL RESOURCE TRUSTEE CONCERNS.

TABLE 2

CHRONOLOGICAL SUMMARY OF DISPOSAL AND REMEDIAL HISTORY

DATE	ACTIVITY
1958	SAND AND GRAVEL OPERATIONS BEGIN; LANDFILLING OPERATIONS INCLUDING LIQUID AS WELL AS SEMI-SOLID CHEMICAL, INDUSTRIAL, AND HOUSEHOLD WASTE DISPOSAL BEGINS THEREAFTER.
1963-1971	NJDOH PERIODICALLY INSPECTS SITE.
1967-1969	OVER 2 MILLION GALLONS OF LIQUID WASTE DISPOSED IN LANDFILL DURING THIS TIME PERIOD.
1968-1969	SITE RECEIVES ACCEPTABLE RATINGS FROM NJDOH.
1969	TWO LANDFILL FIRES CAUSED BY MISHANDLING WASTE.
DECEMBER 1969	LIQUID WASTE DISPOSAL ENDS.
1970	NJDOH INSPECTORS FIRST OBSERVE AND REPORT LEACHATE SEEPS ALONG BLUFF OVERLOOKING CHESTNUT BRANCH.
MAY 1971	SOLID WASTE DISPOSAL ENDS.
JULY 1971	NJDEP NOTIFIES NICK LIPARI OF HIS RESPONSIBILITY TO CLEAN UP SITE.
1972	NJDEP FILES SUIT AGAINST LIPARI AND REQUESTS CLEANUP OF SITE.
1972	LIPARI IMPLEMENTS REMEDIAL ACTIONS; LIPARI CONSTRUCTS DRAINAGE DITCHES, REGRADES, AND SPREADS LIME WITH LITTLE EFFECT.
1973	LIPARI SPREADS LIME AND FILLS LOW AREAS WITH LITTLE EFFECT.
1974	LIPARI ORDERED BY COURT TO CLEAN UP THE SITE.
1974	LIPARI IMPLEMENTS ADDITIONAL REMEDIAL ACTIONS.
AUGUST 1982	EPA ISSUES FIRST RECORD OF DECISION.
1982	FENCE INSTALLED AROUND THE LANDFILL SITE.
AUGUST 1983	SECOND FENCE INSTALLED ALONG CHESTNUT BRANCH.

TABLE 2
(CONTINUED)

CHRONOLOGICAL SUMMARY OF DISPOSAL AND REMEDIAL HISTORY

DATE	ACTIVITY
AUGUST 1983	WORK BEGINS ON REMEDIAL ACTIONS, INCLUDING SLURRY CUTOFF WALL, SURFACE CAP, GAS VENTS, AND SURFACE WATER RUNOFF CONTROLS.
DECEMBER 1983	SLURRY WALL COMPLETED; SURFACE CAP INSTALLATION BEGINS.
DECEMBER 1983	COLD WEATHER STOPS WORK ON CAP WITH ONLY 70 PERCENT OF CAP COMPLETED.
MARCH 1984	WORK RESUMES ON LANDFILL CAP.
MAY 1984	WATER TABLE RISES TO TOP OF CUTOFF WALL, AFFECTING SURFACE CAP.
SEPTEMBER 1984	TEMPORARY GROUND WATER DEWATERING AND TREATMENT SYSTEM INSTALLED.
OCTOBER 1984	PUMP-DOWN COMPLETED.
NOVEMBER 1984	OUTSIDE WORK COMPLETED.
SEPTEMBER 1985	EPA ISSUES SECOND RECORD OF DECISION.

TABLE 4

REPRESENTATIVE LIPARI CONTAMINANTS IN GROUNDWATER, MARSH AND AIR--POST CONTAINMENT CONSTRUCTION (1984)

	DOWNGRADIENT GROUNDWATER COHANSEY UG/L	KIRKWOOD UG/L	LEACHATE UG/L	AIR-BORNE MARSH PPB	RESIDENTIAL PPB
ACETONE	-	58,000	21,000	1,000	369
BENZENE	6,900	3,770	3,900	1,100	25
BCEE	240,000	88,700	27,852* 12,000	1,100	35
1,1-DCA	66J	780	137* 3.6J	-	180
1,2-DCA	8,500	14,000	1,525* 1,200	290	10J
METHYLENE-CHLORIDE	14,000	11,300	4,600B 2,200	120	24J
MIK	8,300	106,000	24,319* 22,000	NA	12J
NAPHTHALENE	-	-	4,200	120	NA
PHENOL	21,000	28,000	9,468* 8,600	60	NA
TOLUENE	26,000	47,800	7,600	2,500	18

NA - NOT ANALYZED

J - ESTIMATED

B - PRESENT IN BLANK, 2ND NUMBER REPRESENTS HIGHEST CONCENTRATION WITHOUT A "B".

* - DID NOT PASS QA/QC, 2ND NUMBER REPRESENTS HIGHEST CONCENTRATION WITHOUT QA/QC QUALIFIER.

- - NOT DETECTED

BCEE - BIS(2-CHLOROETHYL)ETHER
1,1-DCA - 1,1-DICHLOROETHANE
1,2-DCA - 1,2-DICHLOROETHANE
MIK - METHYL ISOBUTYL KETONE, ALSO KNOWN AS 4-METHYL-2-PENTANONE, MIBK, AND HEXONE.

TABLE 5

RISK ASSESSMENT

COMPOUND	LOCATION	PATHWAY	RISK (AVERAGE)	RISK (MAXIMUM)
ARSENIC*	LEACHATE	DERMAL CONTACT	2X10-8	4X10-6
BCEE**	ALCYON LAKE	CONSUMPTION OF FISH	5X10-7	4X10-6
BCEE	ALCYON LAKE	SWIMMING	1X10-7	3X10-7
BENZENE	MARSH FENCE	INHALATION	-	2X10-5
BCEE	"	"	-	6X10-4
1,2-DCA***	"	"	-	2X10-6

RISK ASSESSMENT FOR POTENTIAL HUMAN HEALTH IMPACTS FOR LONG-TERM EXPOSURE TO CONTAMINANTS (FROM OFF-SITE RI REPORT).

* ARSENIC CONCENTRATIONS IN LOCAL SOILS POSE A SIMILAR RISK.

** BIS(2-CHLOROETHYL)ETHER

*** 1,2-DICHLOROETHANE

TABLE 6

FRESH WATER QUALITY CRITERIA (UG/L) FEDERAL CLEAN WATER ACT

COMPOUND	LOCATION & CONCENTRATION			HUMAN HEALTH	FRESH WATER AQUATICLIFE		
	CHESTNUT BRANCH	RABBIT RUN	ALCYON LAKE	WATER & FISH INGESTION	FISH ONLY	ACUTE	CHRONIC
ARSENIC	-	10J	7.6J	2.2	17.5	360	190
BENZENE	9.7B	-	100J	.66	40	5300	-
BCEE	20J	87	19	.03	1.36	-	-
BERYLLIUM	ND	4.2	1.5	.0037	.064	100	53
CADMIUM	ND	6.7	6.9*(0.1)	10	-	39	11
CHROMIUM**	1470	14	2190	-	-	1700	210
COPPER	23	25	ND	170 MG	3433 MG	18	12
LEAD	16	82J	234*(125)	50	-	8.2	3.2
MERCURY	ND	.12	.30	144 NG	146 NG	24	.012
NICKEL	14	16	7.4	13.4	100	1800	96
SILVER	6*(5)	ND	ND	50	-	4.1	0.12

**(CHROMIUM - TRIVALENT)

FRESH WATER 2 NON TROUT (UG/L) NJ SURFACE WATER STANDARDS (NJAC:9-4.1 ET SEQ)

COMPOUND	LOCATION			STANDARD
	RABBIT RUN	CHESTNUT BRANCH	ALCYON LAKE	
ARSENIC	10J	-	7.6J	50
CHROMIUM	14	1470	2190	50
LEAD	82J	17*(16)	234*(125)	50

* DID NOT PASS QA/QC (NUMBER IN PARENTHESIS IS THE HIGHEST DETECTED VALUE WITHOUT A QA/QC QUALIFIER)

J - ESTIMATED NG - NANOGRAMS ND - NOT DETECTED

B - PRESENT IN BLANK - NO STANDARD HAS BEEN PROMULGATED

TABLE 6 (CONT.)

SURFACE WATER QUALITY CRITERIA FOR FRESHWATER CLASS 2--NONTROUT

TOXIC SUBSTANCE	MAXIMUM CONCENTRATION (PPB)	TOXIC SUBSTANCE	MAXIMUM CONCENTRATION (PPB)
ALDREN/DIELDRIN	0.0019	ENDOSULFAN	0.056
AMMONIA, UN-IONIZEDA	50	ENDRIN	0.0023
TOTAL ARSENIC	50	HEPTACHLOR	0.0038
TOTAL BARIUM	1,000	TOTAL LEAD	50
BENZIDINE	0.1	LINDANE	0.080
TOTAL CADMIUM	10	TOTAL MERCURY	2.0
CHLORDANE	0.0043	PCB	0.014
TOTAL RESIDUAL CHLORINE	3.0	TOTAL SELENIUM	10
TOTAL CHROMIUM	50	TOTAL SILVER	50
DDT AND METABOLITES	0.0010	TOXAPHENE	0.013

A 24-HOUR AVERAGE.

TABLE 6 (CONT.)

	MAXIMUM DETECTED CONCENTRATION IN KIRKWOOD AQUIFER (UG/L)	FRESH WATER AQUATIC LIFE FRESH ACUTE (UG/L)	FRESH CHRONIC (UG/L)	INGESTION CONSUMPTION ONLY (UG/L)
VOLATILES:				
ACETONE	66,000			
BENZENE	2600J	5,300		
2- BUTANONE	25,000			
CHLOROFORM	86	28,900	1,240	
1,2 DICHLOROETHANE	14,000	11,800	20,000	
ETHYLBENZENE	1,770	32,000		
METHYLENE CHLORIDE	8,800			
4-METHYL-2 PENTANONE	106,000			
TOLUENE	25,000	17,500		
1,1,1,- TRICHLOROETHANE	25,000	18,000	9,400	
TOTAL XYLENES	25,000			
SEMI-VOLATILES:				
BENZOIC ACID	54,000			
BIS (2- CHLOROETHYL) ETHER	55,000			
BIS (2- ETHYLHEXYL) PHTHLATE	10 J			

TABLE 6 (CONT.)

	MAXIMUM DETECTED CONCENTRATION IN KIRKWOOD AQUIFER (UG/L)	HUMAN HEALTH WATER AND FISH INGESTION (UG/L)	FISH CONSUMPTION ONLY (UG/L)
VOLATILES:			
ACETONE	66,000		
BENZENE	2600J	0.66	40
2- BUTANONE	25,000		
CHLOROFORM	86	0.19	15.7
1,2 DICHLOROETHANE	14,000		
ETHYLBENZENE	1,770	1.4 MG	3.28 MG
METHYLENE CHLORIDE	8,800		
4-METHYL-2 PENTANONE	106,000		
TOLUENE	25,000	14.3 MG	424 MG
1,1,1,- TRICHLOROETHANE	25,000	0.6	41.8
TOTAL XYLENES	25,000		
SEMI_-VOLATILES:			
BENZOIC ACID	54,000		
BIS (2- CHLOROETHYL) ETHER	55,000	0.03	1.36
BIS (2- ETHYLHEXYL) PHTHLATE	10 J		

(TABLE 6 CONT.)

	MAXIMUM DETECTED CONCENTRATION IN KIRKWOOD AQUIFER	FRESH WATER AQUATIC LIFE	
		FRESH ACUTE	FRESH CHRONIC
ISOPHORONE	1,500	117,000	
4-METHYLPHENOL	2,900		
PHENOL	28,000	10,200	2560
INORGANICS:			
ARSENIC	19	360	190
CADMIUM	64	39	11
CHROMIUM (III)	268	1,700	210
LEAD	1,040 J	8.2	3.2
MERCURY	0.75 R*	24	0.012
NICKEL	278	1,800	96
ZINC	35,000	130	110

* SPIKED SAMPLE RECOVERY UNACCEPTABLE

(TABLE 6 CONT.)

	MAXIMUM DETECTED CONCENTRATION IN KIRKWOOD AQUIFER	HUMAN HEALTH WATER & FISH INGESTION	FISH ONLY
ISOPHORONE	1,500	5.2 MG	520 MG
4-METHYLPHENOL	2,900		
PHENOL	28,000	30	
INORGANICS:			
ARSENIC	19	2.2	17.5
CADMIUM	64	10	
CHROMIUM (III)	268		
LEAD	1,040 J	50	
MERCURY	0.75 R*	144 NG	146 NG
NICKEL	278	13.4	100
ZINC	35,000	5 MG	

* SPIKED SAMPLE RECOVERY UNACCEPTABLE

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	ADVANTAGES
SOURCE CONTROL AND CONTAINMENT	CONTROL MIGRATION OR CONTAIN WASTE TO PREVENT VERTICAL OR HORIZONTAL MIGRATION OF LEACHATE; AND PREVENT PUBLIC AND ENVIRONMENTAL EXPOSURE.
STRUCTURAL CONTAIN-MENT	
MARSH	
-IMPERMEABLE SURFACE COVER	PREVENTS DIRECT RAIN INFILTRATION; PREVENT INHALATION AND INGESTION EXPOSURE.
-PERMEABLE SURFACE COVER	MINIMIZE INHALATION AND INGESTION EXPOSURE; ALLOWS DIRECT RAIN IN-FILTRATION THAT ENCHANCES NATURAL FLUSHING.
LAKE	
-SEDIMENT CAPPING	REDUCES EROSION AND LEACHING OF CONTAMINATED SEDIMENTS.

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	DISADVANTAGES	PASSED SCREENING CATEGORY 1*	2*
SOURCE CONTROL AND CONTAINMENT	POTENTIAL FUTURE DETERIORATION SOURCE CONTROL OR CONTAINMENT BARRIERS.		
STRUCTURAL CONTAINMENT			
MARSH			
-IMPERMEABLE SURFACE COVER	MINIMIZES NATURAL FLUSHING. REQUIRES LONG-TERM MAINTENANCE AND MONITORING.	YES	YES
-PERMEABLE SURFACE COVER	HYDRAULIC CONTROLS OF THE GROUND WATER REQUIRED WHERE CONTAMINANTS EXISTS TO MINIMIZE RECONTAMINATION. REQUIRES LONGTERM MAINTENANCE AND MONITORING.	YES	YES
LAKE			
-SEDIMENT CAPPING	GROUT OR SEALANT MAY IMPACT OVERLYING WATER. COVERAGE MAY BE INCOMPLETE. LIMITED TO PROTECTED BODIES OF WATER. MAY REQUIRE PRIOR COMPACTION OF BOTTOM SEDIMENTS.	YES	NO

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

PASSED SCREENING

TECHNOLOGY	CATAGORY ADVANTAGES
MARSH	
-BOTTOM LINER	REDUCE VERTICAL MIGRATION OF LEACHATE.
-SLURRY WALLS	CONTAIN WASTE.
-SHEET PILES	PROVIDES LOWEST PERMEABILITY OF HORIZONTAL FLOW BARRIERS AVAILABLE WHEN PROPERLY SEALED.
-GROUT CURTAINS	MINIMIZES CONTAMINANT MIGRATION.
-SYNTHETIC MEMBRANE	MINIMIZES RAIN INFILTRATION AND SUBSEQUENT CONTACT WITH WASTE TO REDUCE MIGRATION OF LEACHATE.

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	DISADVANGES	PASSED SCREENING CATAGORY 1*	2*
MARSH			
-BOTTOM LINER	TECHNOLOGY NOT FEASIBLE. VARYING GEOLOGY ACROSS THE MARSH INCREASES DIFFICULTIES INVOLVED IN APPLICATION OF THE LINER.	NO	NO
-SLURRY WALLS	REQUIRES HYDRAULIC CONTROLS. MOST EFFECTIVE WHEN KEYED INTO NATURAL CLAY BOTTOM LINER WHICH, HOWEVER, DOES NOT EXIST IN MARSH. REQUIRES LEVEL TERRAIN NOT PRESENT IN MARSH.	NO	NO
-SHEET PILES	GEOLOGY WILL NOT SUPPORT A "HANGING" WALL. DEPTH FOR CONTAINMENT EXCEEDS LENGTH OF PILES.	NO	NO
-GROUT CURTAINS	RARELY USED IN UNCONSOLIDATED FORMATIONS. SUBJECT TO CHEMICAL DECOMPOSITION.	NO	NO
-SYNTHETIC MEMBRANE	DIFFICULT TO INCORPORATE INTO SLURRY WALL CONSTRUCTION. REQUIRES COMPLETE EXCAVATION OF CONTAMINATED SOILS.	NO	NO

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TEHNOLOGY	ADVANTAGES
-PUMPING WELLS OFFSITE COLLECTION AND COLLECT SEEPAGE FROM MARSH.	ACTIVE CONTROL OF CONTAMINANT BY LOWERING WATER TABLE BELOW SOURCE.
-SUBSURFACE DRAINS OFFSITE COLLECTION	PASSIVE SYSTEM TO COLLECT WATER DOWNGRADIENT OF SOURCE. LOW MAINTENANCE AND OPERATION.
IN STU TREATMENT	
- SOLIDIFICATION/FIXATION	
-CEMENT/LIME-BASED	SUITABLE TO REDUCE LEACHABILITY OF METALS AND SOME ORGANCS.
THERMOPLASTICS	SUITABLE TO REDUCE LEACHABILITY OF METALS AND SOME ORGANICS.

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TEHNOLOGY	DISADVANTAGES	PASSED SCREENIN CATAGORY 1*	2*
-PUMPING WELLS OFFSITE COLLECTION AND COLLECT SEEPAGE FROM MARSH.	SOURCE IS NOT CONTAINED. INGESTION AND INHALATION RISK STILL EXIST. CONSIDERED UNDER OTHER REMEDIAL ACTION CATEGORIES.	YES	NO
-SUBSURFACE DRAINS OFFSITE COLLECTION	SOURCE IS NOT CONTAINED. INGESTION AND INHALATION RISKS STILL EXIST. LIMITED TO SHALLOW DEPTHS. CONSIDERED UNDER OTHER REMEDIAL ACTION CATEGORIES.	YES	NO
IN STU TREATMENT			
- SOLIDIFICATION/FIXATION			
-CEMENT/LIME-BASED	MUST BE USED IN CONJUCTION WITH ENCAPSULATION SYSTEM. MACHINERY NOT AVAILABLE TO PERFORM PROCESS IN SATURATED SOIL AND STEEP SLOPE CONDITIONS.	NO	NO
-THERMOPLASTICS	NOT SUITABLE FOR VOLATILE ORGANICS. STABILIZERS ALSO SOURCE OF ORGANIC CONTAMINANTS. IN-STU MIXING NOT READILY CONTROLLED.	NO	NO

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	ADVANTAGES
-ORGANIC POLYMERS	SUITABLE TO REDUCE LEACHABILITY OF METALS AND SOME ORGANICS.
-VITRIFICATION	COVERTS CONTAMINANTS WITHIN A SOIL MATRIX INTO A STABLE IMMOBILE GLASS-LIKE SOLID MASS.
-CHEMICAL FIXATION	METAL IMMOBILIZATION CAN BE ENHANCED BY USE OF ORGANIC ADDITIVES THAT INCREASE SORPTION, ION EXCHANGE OR PRECIPITATION.
CHEMICAL OXIDATION	OXIDATION REACTIONS THAT MAY DETOXIFY, DECOMPOSE, OR RENDER ORGANICS MORE AMENABLE TO BIODEGRADATION.
BIODEGRADATION	INTENDED TO BIOLOGICALLY DEGRADE ORGANICS TO CARBON DIOXIDE, WATER, AND NON-TOXIC BY-PRODUCTS.

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	DISADVANTAGES	PASSED SCREENI CATAGORY 1*	2*
-ORGANIC POLYMERS	APPLICATION TO ALL ORGANICS NOT DEMONSTRATED. NOT SUITABLE TO IN-SITU APPLICATION DUE TO NEED TO REGULATE REACTOR TEMPERATURES.	NO	NO
-VITRIFICATION	ALTERATION OF GROUND WATER HYDROLOGY. REQUIRES TEMPORARY STRUCTURE OVER THE PROCESSING AREA WHICH IS NOT POSSIBLE IN STEEP SLOPES USING EXISTING TECHNOLOGY.	NO	NO
-CHEMICAL FIXATION	DIFFICULT TO CONTROL DOSAGE RATES OF ADDITIVES; BIODEGRADATION OF ORGANIC FIXATIVES MAY RENDER COMPOUNDS LEACHABLE IN THE FUTURE.	NO	NO
CHEMICAL OXIDATION	CHEMICAL AGENTS DO NOT DISCRIMINATE BETWEEN SUBSTANCES. MAY RESULT IN PRODUCTION OF TOXIC DEGRADATION PRODUCTS. LIMITED FIELD INFORMATION.	NO	NO
BIODEGRADATION	NOT EFFECTIVE IN REMOVING METALS. DIFFICULT TO MAINTAIN AEROBIC CONDITIONS IN THE MARSH.	NO	NO

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	ADVANTAGES
SOIL FLUSHING	ACCELERATES LEACHING OF WATER SOLUBLE CONTAMINANTS UNDER CONTROLLED CONDITIONS; DECREASES TOTAL QUANTITY OF CONTAMINANTS SUSEPTIBLE TO TRANSPORT.
ENHANCED VOLATILIZATION	
- VACUUM VAPOR EXTRACTION	REMOVES VOLATILE ORGANICS IN AMBIENT TEMPERATURES
- THERMAL VAPOR EXTRACTION	ENHANCES VOLATILIZATION OF ORGANICS OR THEIR THERMAL DECOMPOSITION
DELIVERY AND RECOVERY TECHNOLOGIES	
- DITCHES	SIMPLE MEANS TO PROMOTE WATER PERCOLATION THROUGH SUBSURFACE SOIL.
- INFILTRATION GALLERY	PROVIDE EFFECTIVE GRAVITY APPLICATION OF WATER TO AFFECTED AREA. SUITABLE IN VARIABLE TERRAIN.

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	DISADVANTAGES	PASSED SCREENING CATEGORY 1*	2*
SOIL FLUSHING	LOW SOLUBILITY COMPOUNDS REMAINING AFTER FLUSHING MAY BE RELEASED IF ENVIRONMENTAL CONDITIONS CHANGE; EFFICIENCY DECREASES AS DECONTAMINATION PROCEEDS; LARGE VOLUMES OF LEACHATE ARE PRODUCED REQUIRING TREATMENT.	YES	YES
ENHANCED VOLATILIZATION			
- VACUUM VAPOR EXTRACTION	SHORT-CIRCUITING RESULTS IN WITHDRAWAL OF ONLY AIR. REQUIRES UNSATURATED CONDITIONS.	NO	NO
- THERMAL VAPOR EXTRACTION	REQUIRES VAPOR RECOVERY SYSTEM. LIMITED TO PILOT-SCALE STUDIES. IMPLEMENTABILITY UNCERTAIN. UNEVEN TOPOGRAPHY LIMITS APPLICABILITY.	NO	NO
DELIVERY AND RECOVERY TECHNOLOGIES			
- DITCHES	NOT SUITABLE FOR STEEP OR UNVEN TERRAIN AS IN THE MARSH. PRONE TO CLOGGING.	NO	NO
- INFILTRATION GALLERY	FUNCTION SIMILAR TO DITCHES, BUT LESS SUSEPTIBLE TO CLOGGING.	YES	NO

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	ADVANTAGES
- SPRINKLER IRRIGATION	SIMPLE MEANS TO PROMOTE WATER INFILTRATION OVER SOIL SURFACE/ SUBSURFACE SOIL.
- FORCED DELIVERY SYSTEM	PROVIDE EFFECTIVE APPLICATION OF WATER TO AFFECTED AREA. INDEPENDENT OF SITE TOPOGRAPHY
- OPEN DITCH	SIMPLE MEANS TO COLLECT AND TRANSPORT WATER.
- SEEPAGE DITCH (BURIED DRAINS)	PROVIDE EFFECTIVE MEANS TO COLLECT AND TRANSPORT WATER. CAN BE DESIGNED FOR A RANGE OF DEPTHS.
- WELL POINT SYSTEMS	ACTIVE PUMPING SYSTEM. MORE EFFECTIVE MEANS OF INCREASING WITHDRAWAL OF WATER THAN DRAINS.
TREATMENT	
EXCAVATION	EXCAVATE SOIL AND TREAT TO REDUCE TOXICITY, MOBILITY, OR VOLUME OF WASTE. REDUCE ENVIRONMENTAL AND PUBLIC HEALTH RISKS.

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	DISADVANTAGES	PASSED SCREENING CATEGORY 1*	2*
- SPRINKLER IRRIGATION	WATER FREEZES IN PIPES. LIMITED BY SOIL PERMEABILITY AND RATE OF EVAPORATION.	YES	YES**
- FORCED DELIVERY SYSTEM	MUST UNDERSTAND HYDROGEOLOGY TO CALCULATE MAXIMUM INJECTION PRESSURES.	YES	YES
- OPEN DITCH	NOT SUITABLE FOR STEEP UNEVEN TERRAIN.	NO	NO
- SEEPAGE DITCH (BURIED DRAINS)	GREATER VOLUME OF WATER COLLECTED IN A DITCH SYSTEM DUE TO LACK OF CONTROL ASSOCIATED WITH RAINFALL WATER.	YES	YES**
- WELL POINT SYSTEMS	MUST UNDERSTAND HYDROGEOLOGY TO CALCULATE NUMBER OF WELLS. LIMITED TO SHALLOW DEPTHS AND SOILS WITH MODERATE HYDRAULIC CONDUCTIVITY.	YES	YES
TREATMENT			
EXCAVATION	EXCAVATION AND REPLACEMENT OF SOIL REQUIRED. METALS WILL STILL REQUIRE LONG-TERM CONTAINMENT. REQUIRES VOLATILE EMISSION CONTROLS.	YES	YES

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	ADVANTAGES
- MECHANICAL AERATION	PROVEN TECHNOLOGY TO PROMOTE VOLATILATION.
CEMENT/LIME-BASED FIXATIVE	FORM NON-LEACHABLE MONO-LITHIC MATERIAL.
VITRIFICATION	CONVERTS SOIL AND CONTAMINANTS INTO CHEMICALLY INERT MATRIX.
SOIL WASHING	PROCESS TRANSFERS SOIL CONTAMINANTS TO A LIQUID PHASE FOR TREAMENT OR DISPOSAL.
BIORECLAMATION	MINIMUM ENERGY AND THE PROCESS IS ODORLESS. DEGRADES ORGANIC WASTES TO CARBON DIOXIDE AND WATER.
DISPOSAL	
- CONSTRUCT LANDFILL	EXCAVATION AND LANDFILLING ALLOWS THE OPPORTUNITY TO CONSTRUCT A SECURE LANDFILL; PREVENT PUBLIC AND ENVIRONMENTAL EXPOSURE.

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	DISADVANTAGES	PASSED SCREENING CATEGORY 1*	2*
- MECHANICAL AERATION	NOT AS EFFECTIVE ON ALL ORGANICS. HAMPERED BY WET SOILS. OFF-GAS CONTROL IS DIFFICULT.	NO	NO
CEMENT/LIME-BASED FIXATIVE	NOT AS EFFECTIVE ON MOIST SOILS. STABILIZES METALS BUT NOT ORGANICS.	NO	NO
VITRIFICATION	REQUIRES CAPTURE OF OFF-GASES.	NO	NO
SOIL WASHING	UNPROVEN TECHNOLOGY FOR TREATMENT OF MIXED WASTE. GENERATES LARGE VOLUMES OF LEACHATE FOR DISPOSAL OR TREATMENT.	NO	NO
BIORECLAMATION	NOT APPLICABLE TO WASTES CONTAINING METALS. NOT A PROVEN TECHNOLOGY FOR ALL MIXTURES OF HAZARDOUS WASTES.	NO	NO
DISPOSAL			
- CONSTRUCT LANDFILL	INSTITUTIONALLY DIFFICULT TO IMPLEMENT	YES	YES

TABLE 7

REMEDIAL TECHNOLOGIES SCREEENING SUMMARY

TECHNOLOGY	ADVANTAGES
- CONSTRUCT OVER EXISTING LANDFILL	EXCAVATION AND LANDFILLING ALLOWS THE OPPORTUNITY TO CONSTRUCT A SECURE LANDFILL; PREVENT PUBLIC AND ENVIRONMENTAL EXPOSURE.
DISPOSAL AT EXISTING	TRANSFERS WASTE SOURCE TO A FACILITY
RCRA FACILITY	FOR OFFSITE TREATMENT, STORAGE, OR DISPOSAL; NO FUTURE PUBLIC HEALTH OR ENVIRONMENTAL RISK AT THE SITE.
DISPOSAL AS A NON-HAZARDOUS MATERIAL	TREATED MATERIALS REMOVED FROM IMPACTED AREAS. NO FUTURE RELEASE OF CONTAMINANTS TO THE ENVIRONMENT.

*SCREENED COLLECTIVELY FOR USE UNDER SOIL FLUSHING, AS WELL AS THE OFFSITE COLLECTION AND GROUND WATER RECOVERY SYSTEM TECHNOLOGY CATEGORIES.

SCREENING CATEGORY;
* PASS 1 - PASSED TECHNICAL SCREEN
* PASS 2 - PASSED ENVIRONMENTAL, PUBLIC HEALTH, INSTITUTIONAL SCREEN.

TABLE 7

REMEDIAL TECHNOLOGIES SCREEENING SUMMARY

TECHNOLOGY	DISADVANTAGES	PASSED SCREENING CATEGORY 1*	2*
- CONSTRUCT OVER EXISTING LANDFILL	INSTITUTIONALLY DIFFICULT TO IMPLEMENT. DIMINISHED INTEGRITY OF PRESENT CAP. NOT POSSIBLE TO MAINTAIN LEACHATE SYSTEM TO SPECIFICATIONS DUE TO DIFFERENTIAL SETTLING.	NO	NO
DISPOSAL AT EXISTING RCRA FACILITY	ADEQUATE TDS FACILITY WILL NEED TO BE IDENTIFIED SUCH THAT PUBLIC HEALTH RISKS ARE NOT JUST DISPLACED TO ANOTHER FACILITY.	YES	YES
DISPOSAL AS A NON-HAZARDOUS MATERIAL	AVAILABILITY OF RACETRACK AND/OR MUNICIPAL LANDFILLS UNCERTAIN. DISPOSAL ON TOP OF LIPARI LANDFILL MAY IMPACT ONSITE CLEANUP.	YES	YES

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	ADVANTAGES
DREDGING	
- MECHANICAL DREDGING	REMOVES CONTAMINATED SEDIMENTS
- HYDRAULIC DREDGING	REMOVES CONTAMINATED SEDIMENTS. CAN BE ACCOMPLISHED WITHOUT SURFACE WATER DRAINAGE.
SOIL STAGING	NECESSARY AS PART OF DREDGING/ EXCAVATION ALTERNATIVE.
INCINERATION	REDUCES WASTES TO INORGANIC ASH.
VOLATILIZATION - THERMAL TREATMENT	PROVEN TECHNOLOGY TO PROMOTE VOLATILIZATION IN SOLID MEDIA; VOLATILES CAPTURED FOR TREATMENT.

TABLE 7

REMEDIAL TECHNOLOGIES SCREENING SUMMARY

TECHNOLOGY	DISADVANTAGES	PASSED SCREENING CATEGORY 1*	2*
DREDGING			
- MECHANICAL DREDGING	LIMITED TO SHALLOW, LOW FLOW AREAS. MUST DRAIN LAKE AND PROVIDE FIRM BOTTOM SUPPORT.	YES	NO
- HYDRAULIC DREDGING	LOW SOLIDS TO WATER RATIO REQUIRING DEWATERING. TURBIDITY INCREASES.	YES	YES
SOIL STAGING	INCREASES CHANCE OF SOIL EROSION AND CONTAMINANT MIGRATION.	YES	YES
INCINERATION	METALS REQUIRE SEPARATE HANDLING AND TREATMENT FOR FINAL DISPOSAL. HIGH WATER CONTENT OF SOILS REDUCES HEATING VALUE AND MAY REQUIRE DEWATERING. WILL PROVIDE MINIMAL REDUCTION IN BULK VOLUME.	NO	NO
VOLATILIZATION			
- THERMAL TREATMENT	METALS ARE NOT TREATED. REQUIRES CAREFUL MONITORING OF VOC EMISSIONS.	YES	YES

TABLE 8

APROPRIATE SOIL CONCENTRATIONS FOR METALS (MG/KG)

	ECRA SOIL OBJECTIVES	N.J. SOIL RANGE	U.S. SOIL RANGE	SLUDGE APPLICATION GUIDELINES* AVERAGE	(RANGE)
ARSENIC	20	--	10-100	10	(1.1-230)
CHROMIUM	100	5-48	5-100	500	(10-99,000)
LEAD	250-1000	1-180	2-200	500	(13-26,000)
MERCURY	1	-	.010-4.6	6	(0.6-56)
NICKEL	100	11-87	8-550	80	(2-5300)
SELENIUM	4	.010-4	.010-5	5	(1.7-17.2)
SILVER	5	-	.010-5	-	-
ZINC	250	4.5-168	10-3000	1700	(101-49,000)

* EPA 625/10-84-003 USE AND DISPOSAL OF MUNICIPAL WASTEWATER SLUDGE

SOIL AND SEDIMENT CONCENTRATINS AT OFF-SITE LIPARI AREAS (MG/KG)

	ALCYON LAKE	CHESTNUT BRANCH MARSH	RABBIT RUN		CHESTNUT BRANCH STREAM	
ARSENIC	9.1 (67)	10.2 (65)	-	-	0.66	1.14
CHROMIUM	60 (234)	14.3 (78)	2.9	(12)	6.3	12
LEAD	178 (597)	85.6 (424)	15.3	(38)	45.2	129
MERCURY	0.35 (1.1)	0.09 (0.5)	0.03	(.12)	0.78	1.4
NICKEL	26 (123)	20.5 (112)	-	-	2.99	11
SELENIUM	- -	- -	-	-	-	-
SILVER	0.6 (6.5)	- -	-	-	-	-
ZINC	187 (522)	85.9 (325)	16.6	(36)	18.9	36

* NOTE: THE FIRST NUMBER IS THE AVERAGE CONCENTRATION; THE NUMBER IN PARENTHESES IS THE MAXIMUM CONCENTRATION DETECTED.

TABLE 10

SELECTED ALTERNATIVE	COST	CLEANUP ALTERNATIVES COST RANGE
OFF SITE COLLECTION		
2B. FRENCH DRAIN WITH COVER	$5.81M	$5.78 - $6.37M
CHESTNUT BRANCH MARSH		
9B. EXCAVATION, THERMAL TREATMENT, PLACEMENT AS A NON-HAZARDOUS MATERIAL	$7.2M	$3.67 - $29.53M
ALCYON LAKE		
12B. DREDGE, DEWATER, THERMAL TREATMENT, PLACEMENT AS A NON-HAZARDOUS MATERIAL	$5.78M	$5.78 - $20.74M
RABBIT RUN		
14B. DREDGE, DEWATER, THERMAL TREATMENT, PLACEMENT AS A NON-HAZARDOUS MATERIAL	$0.04M	$0.04 - $0.16M
KIRKWOOD AQUIFER		
16. PUMP AND TREAT ON-SITE	$1.76M	$1.76M
CHESTNUT BRANCH STREAM		
18B. DREDGE, DEWATER, THERMAL TREATMENT, PLACEMENT AS A NON-HAZARDOUS MATERIAL	$0.08M	$0.08 - $0.34M
INTERIM MEASURE		
19. CHESTNUT BRANCH MARSH	$0.3M	$0.3M

ATTACHMENT A

GROUNDWATER CHARACTERISTICS OF LIPARI LANDFILL SAMPLES

GROUND WATER CHARACTERISTICS OF LIPARI LANDFILL SAMPLES

RADIAN CORP.

VOLATILE ORGANIC CONTAMINANT	FIELD(A) 1983 (PPB)	LAB(B) 1983 (PPB)
ACROLEIN	NR	NR
ACRYLONITRILE	NR	NR
BENZENE	3,000	4,500
BROMOFORM	NR	NR
BROMOMETHANE	NR	NR
CARBON TETRACHLORIDE	NR	NR
CHLOROBENZENE	18	50
CHLOROBROMOMETHANE	NR	NR
CHLOROETHANE	12	50
2-CHLOROETHYLVINYL EITHER	NR	NR
CHLOROFORM	8	48
CHLOROMETHANE	NR	NR
DICHLOROBROMOMETHANE	NR	NR
DICHLORODIFLUOROMETHANE	NR	NR
1,1-DICHLOROETHANE	54	50
1,2-DICHLOROETHANE	5,900	8,100
1,1-DICHLOROETHYLENE	4	50
1,2-DICHLOROPROPANE	NR	NR
1,3-DICHLOROPROPYLENE	NR	NR
ETHYLBENZENE	1,000	420
METHYL BROMIDE	NR	NR
ETHENE DIBROMIDE	NR	NR
METHYL CHLORIDE	NR	NR
METHYLENE CHLORIDE	510	3,300
1,1,2,2-TETRACHLOROETHANE	NA	NR
TETRACHLOROETHYLENE	7	50
TOLUENE	9,900	30,000
TRANS-1,2-DICHLOROETHENE	26	50
1,1,1-TRICHLOROETHANE	1	50
1,1,2-TRICHLOROETHANE	NR	NR
TRICHLOROETHYLENE	14	50
TRICHLOROFLUOROMETHANE	NR	NR
VINYL CHLORIDE	10	50
TOTAL VOLATILE ORGANIC COMPOUNDS	NR	NR

ATTACHMENT A (CONTINUED)
GROUND WATER CHARACTERISTICS OF LIPARI LANDFILL SAMPLES

	LIPARI LANDFILL SAMPLING			
VOLATILE ORGANIC CONTAMINANT	JRB(C) 9/26/83 (PPB)	IT CORP(C) 9-10/84 (PPB)	JRB(C,D) 12/84-4/85 (PPB)	CDM(E,F) 3/85 (PPB)
ACROLEIN	NA	500	NA	NA
ACRYLONITRILE	ND	500	NA	NA
BENZENE	5,900	2,200	29,000	1,371
BROMOFORM	500G	50	NA	10G
BROMOMETHANE	NA	NA	NA	10G
CARBON TETRACHLORIDE	100G	50	NA	10G
CHLOROBENZENE	270	110	NA	1,005
CHLOROBROMOMETHANE	100G	50	NA	10G
CHLOROETHANE	47,100G	50	NA	10G
2-CHLOROETHYLVINYL EITHER	250G	500	NA	10G
CHLOROFORM	760	50	NA	750
CHLOROMETHANE	NA	NA	NA	10G
DICHLOROBROMOMETHANE	300	50	NA	10G
DICHLORODIFLUOROMETHANE	250G	500	NA	10G
1,1-DICHLOROETHANE	760	18	630	588
1,2-DICHLOROETHANE	5,500,69,000H	41,000	54,000	75,459
1,1-DICHLOROETHYLENE	78	50	NA	148
1,2-DICHLOROPROPANE	24,50G	50	NA	10G
1,3-DICHLOROPROPYLENE	7,250G	50	NA	10G
ETHYLBENZENE	4,400	2,000	NA	619
METHYL BROMIDE	500G	500	NA	NA
ETHENE DIBROMIDE	NA	NA	NA	20G
METHYL CHLORIDE	1,000G	500	NA	NA
METHYLENE CHLORIDE	39,000	2,800	46,000	17,450
1,1,2,2-TETRACHLOROETHANE	500G	50	NA	10G
TETRACHLOROETHYLENE	40,100G	130	NA	92
TOLUENE	75,000	37,000	87,000	2,056
TRANS-1,2-DICHLOROETHENE	360	88	NA	219
1,1,1-TRICHLOROETHANE	73,100G	50	NA	10G
1,1,2-TRICHLOROETHANE	250G	50	NA	10G
TRICHLOROETHYLENE	21,100G	220	NA	177
TRICHLOROFLUOROMETHANE	250G	50	NA	699
VINYL CHLORIDE	96,100G	500	NA	10G
TOTAL VOLATILE ORGANIC COMPOUNDS	NA	NR	NA	176,962

ATTACHMENT A (CONTINUED)

GROUND WATER CHARACTERISTICS OF LIPARI LANDFILL SAMPLES

EXTRACTABLE CONTAMINANT	RADIAN CORP. FIELD(A) 1983 (PPB)	RADIAN CORP. LAB(B) 1983 (PPB)
ACID EXTRACTABLES:		
2-CHLOROPHENOL	NR	NR
2,4-DICHLOROPHENOL	9	ND
2,4-DIMETHYLPHENOL	NR	NR
1,4-DINITROPHENOL	NR	NR
4,6-DINITRO-O-CRESOL	NR	NR
2,4-DINITROPHENOL	NR	NR
2-NITROPHENOL	NR	NR
4-NITROPHENOL	110	ND
P-CHLORO-M-CRESOL	NR	NR
2-METHYL-4,6-DINITROPHENOL	NR	NR
PENTACHLOROPHENOL	NR	NR
PHENOL	11,000	22,000
2,4,6-TRICHLOROPHENOL	NR	NR
BASE-NEUTRAL EXTRACTABLES:		
ACENAPHTHENE	NR	NR
ACENAPHTHYLENE	NR	NR
ANTHRACENE	NR	NR
BENZIDINE	NR	NR
BENZO(A)ANTHRACENE	NR	NR
BENZO(A)PYRENE	NR	NR
3,4-BENZOFLUORANTHENE	NR	NR
BENZO(G,H,I)PERYLENE	NR	NR
BENZO(K)FLUORANTHENE	NR	NR
BIS(2-CHLOROETHOXY)METHANE	NR	NR
BIS(2-CHLOROETHYL)ETHER	8,000	12,000
BIS(2-CHLOROISOPROPYL)ETHER	NR	NR
BIS(2-ETHYLHEXYL)PHTHALATE	NR	NR
4-BROMOPHENYL PHENYL ETHER	NR	NR
BUTYLBENZYL PHTHALATE	NR	NR
2-CHLORONAPHTHALENE	NR	NR
4-CHLOROPHENYL PHENYL ETHER	NR	NR
CHRYSENE	NR	NR
DIBENZO(A,H)ANTHRACENE	NR	NR
1,2-DICHLOROBENZENE	150	ND
1,3-DICHLOROBENZENE	NR	NR
1,4-DICHLOROBENZENE	NR	NR
3,3-DICHLOROBENZIDINE	NR	NR

ATTACHMENT A (CONTINUED)

GROUND WATER CHARACTERISTICS OF LIPARI LANDFILL SAMPLES

	LIPARI LANDFILL SAMPLING			
EXTRACTABLE CONTAMINANT	JRB(C) 9/26/83 (PPB)	IT CORP(C) 9-10/84 (PPB)	JRB(C,D) 12/84-4/85 (PPB)	CDM(E,F) 3/85 PPB)
ACID EXTRACTABLES:				
2-CHLOROPHENOL	500G	40	NA	22
2,4-DICHLOROPHENOL	15,500G	13,40	NA	14
2,4-DIMETHYLPHENOL	500G	40	NA	10G
1,4-DINITROPHENOL	NA	NA	NA	35
4,6-DINITRO-O-CRESOL	5,000G	40	NA	NA
2,4-DINITROPHENOL	5,000G	40	NA	40
2-NITROPHENOL	500G	40	NA	20
4-NITROPHENOL	500G	40	NA	NA
P-CHLORO-M-CRESOL	500G	40	NA	10G
2-METHYL-4,6-DINITROPHENOL	NA	NA	NA	10G
PENTACHLOROPHENOL	500G	40	NA	NR
PHENOL	22,000	9,000	NA	10G
2,4,6-TRICHLOROPHENOL	500G	40	NA	20
BASE-NEUTRAL EXTRACTABLES:				
ACENAPHTHENE	100G	40	NA	50G
ACENAPHTHYLENE	100G	5.6,40	NA	50G
ANTHRACENE	100G	40	NA	50G
BENZIDINE	1,000G	160	NA	100G
BENZO(A)ANTHRACENE	1,000G	40	NA	50G
BENZO(A)PYRENE	1,000G	40	NA	50G
3,4-BENZOFLUORANTHENE	100G	40	NA	50G
BENZO(G,H,I)PERYLENE	250G	40	NA	50G
BENZO(K)FLUORANTHENE	100G	40	NA	50G
BIS(2-CHLOROETHOXY)METHANE	200G	40	NA	50G
BIS(2-CHLOROETHYL)ETHER	83,000	15,600	510,000	44
BIS(2-CHLOROISOPROPYL)ETHER	200G	160	NA	50G
BIS(2-ETHYLHEXYL)PHTHALATE	65,100G	40	NA	50G
4-BROMOPHENYL PHENYL ETHER	100G	40	NA	50G
BUTYLBENZYL PHTHALATE	100G	4.0,40	NA	50G
2-CHLORONAPHTHALENE	200G	40	NA	50G
4-CHLOROPHENYL PHENYL ETHER	100G	40	NA	50G
CHRYSENE	100G	40	NA	50G
DIBENZO(A,H)ANTHRACENE	250G	40	NA	50G
1,2-DICHLOROBENZENE	370,400G	440	NA	49
1,3-DICHLOROBENZENE	400G	40	NA	27
1,4-DICHLOROBENZENE	190,400G	3.040	NA	1,619
3,3-DICHLOROBENZIDINE	100G	40	NA	100G

ATTACHMENT A (CONTINUED)

GROUND WATER CHARACTERISTICS OF LIPARI LANDFILL SAMPLES

EXTRACTABLE CONTAMINANT	RADIAN CORP. FIELD(A) 1983 (PPB)	LAB(B) 1983 (PPB)
BASE-NEUTRALS, CONTINUED		
2,4-DICHLOROTOLUENE	NR	NR
M-CHLOROTOLUENE	NR	NR
DIETHYL PHTHALATE	10	1
DIMETHYL PHTHALATE	NR	NR
DI-N-BUTYL PHTHALATE	6	1
2,4-DINITROTOLUENE	NR	NR
2,6-DINITROTOLUENE	NR	NR
DI-N-OCTYL PHTHALATE	NR	NR
1,2-DIPHENYLHYDRAZINE (AS AZOBENZENE)	NR	NR
ETHYLENEIMINE	NR	NR
FLUOROANTHENE	NR	NR
FLUORENE	NR	NR
HEXACHLOROBENZENE	NR	NR
HEXACHLOROBUTADIENE	NR	NR
HEXACHLOROETHANE	NR	NR
IDENO(1,2,3-CD)PYRENE	NR	NR
ISOPHORONE	180	160
NAPHTHALENE	70	280
NITROBENZENE	NR	NR
N-NITROSODIMETHYLAMINE	NR	NR
N-ITROSODI-N-PROPYLAMINE	NR	NR
N-NITROSODIPHENYLAMINE	NR	NR
PHENANTHRENE	NR	NR
PYRENE	NR	NR
1,2,4-TRICHLOROBENZENE	NR	NR
1,2,BIS(2-CHLOROETHOXY) ETHANE	30-70,000	30-70,000
BIS(CHLOROMETHYL)ETHER	NR	NR
2,3,7,8-TETRACHLORODI-BENZO-P-DIOXIN	NR	NR
1,4-DIETHYLENE DIOXIDE	NR	NR

ATTACHMENT A (CONTINUED)

GROUND WATER CHARACTERISTICS OF LIPARI LANDFILL SAMPLES

	LIPARI LANDFILL SAMPLING			
EXTRACTABLE CONTAMINANT	JRB(C) 9/26/83 (PPB)	IT CORP(C) 9-10/84 (PPB)	JRB(C,D) 12/84-4/85 (PPB)	CDM(E,F) 3/85 PPB)
BASE-NEUTRALS, CONTINUED				
2,4-DICHLOROTOLUENE	NA	NA	NA	5,018
M-CHLOROTOLUENE	NA	NA	NA	3,983
DIETHYL PHTHALATE	350	94	NA	50G
DIMETHYL PHTHALATE	100G	40	NA	50G
DI-N-BUTYL PHTHALATE	44	40	NA	50G
2,4-DINITROTOLUENE	100G	40	NA	50G
2,6-DINITROTOLUENE	100G	40	NA	50G
DI-N-OCTYL PHTHALATE	100G	40	NA	50G
1,2-DIPHENYLHYDRAZINE (AS AZOBENZENE)	100G	40	NA	250G
ETHYLENEIMINE	NA	NA	NA	50G
FLUOROANTHENE	100G	40	NA	50G
FLUORENE	100G	40	NA	50G
HEXACHLOROBENZENE	100G	40	NA	50G
HEXACHLOROBUTADIENE	200G	40	NA	50G
HEXACHLOROCYCLOPENTADIENE	200G	40	NA	50G
HEXACHLOROETHANE	400G	40	NA	50G
IDENO(1,2,3-CD)PYRENE	250G	40	NA	50G
ISOPHORONE	200G	160	NA	50G
NAPHTHALENE	430	120	NA	50G
NITROBENZENE	200G	40	NA	50G
N-NITROSODIMETHYLAMINE	ND	40	NA	50G
N-ITROSODI-N-PROPYLAMINE	ND	40	NA	50G
N-NITROSODIPHENYLAMINE	100G	40	NA	50G
PHENANTHRENE	100G	40	NA	50G
PYRENE	100G	40	NA	50G
1,2,4-TRICHLOROBENZENE	200G	40	NA	5,965
1,2,BIS(2-CHLOROETHOXY) ETHANE	140,000	NA	1,600,000	NA
BIS(CHLOROMETHYL)ETHER	NA	40	NA	NA
2,3,7,8-TETRACHLORODI-BENZO-P-DIOXIN	NA	40	NA	NA
1,4-DIETHYLENE DIOXIDE	NA	NA	NA	50G

ATTACHMENT A (CONTINUED)

GROUND WATER CHARACTERISTICS OF LIPARI LANDFILL SAMPLES

	LIPARI LANDFILL SAMPLING					
	RADIAN CORP.					
	FIELD(A)	LAB(B)	JRB(C)	IT CORP(C)	JRB(C,D)	CDM(E,F)
PESTICIDE/PCB CONTAMINANT			9/26/83 (PPB)	9-10/84 (PPB)	12/84-4/85 (PPB)	3/85 (PPB)
ALDRIN	NR	NR	2I	1	NA	0.5G
BHC,ALPHA	NR	NR	2I	1	NA	0.5G
BHC,BETA	NR	NR	2I	1	NA	0.5G
BHC,DELTA	NR	NR	2I	1	NA	0.5G
BHC,GAMMA	NR	NR	2.2	1	NA	0.5G
CHLORDANE	NR	NR	ND	10	NA	0.5G
4,4 'DDT	NR	NR	ND	1	NA	0.5G
4,4 'DDE	NR	NR	ND	1	NA	0.5G
4,4 'DDD	NR	NR	ND	1	NA	0.5G
DIELDRIN	NR	NR	ND	1	NA	0.5G
ENDOSULFAN-ALPHA	NR	NR	2.1	1	NA	0.5G
ENDOSULFAN-BETA	NR	NR	2.1	1	NA	0.5G
ENDOSULFAN-SULFATE	NR	NR	ND	1	NA	0.5G
ENDRIN	NR	NR	2I	1	NA	0.5G
ENDRIN-ALDEHYDE	NR	NR	2	1	NA	0.5G
ENDRIN-KETONE	NR	NR	NA	NA	NA	0.5G
HEPTACHLOR	NR	NR	2I	1	NA	0.5G
HEPTACHLOR-EPOXIDE	NR	NR	2	1	NA	0.5G
PCB-1242	NR	NR	25G	10	NA	0.5G
PCB-1254	NR	NR	25G	10	NA	1.0G
PCB-1221	NR	NR	25G	10	NA	0.5G
PCB-1232	NR	NR	25G	10	NA	0.5G
PCB-1248	NR	NR	25G	10	NA	0.5G
PCB-1260	NR	NR	25G	10	NA	1.0G
PCB-1016	NR	NR	25G	10	NA	0.5G
TOXAPHENE	NR	NR	ND	10	NA	0.5G
METHOXYCHLOR	NR	NR	NA	1	NA	0.5G

ATTACHMENT A (CONTINUED)

GROUND WATER CHARACTERISTICS OF LIPARI LANDFILL SAMPLES

VOLATILE NONPRIORITY POLLUTANT	IT CORP(C) 9-10/84 (PPB)	BASE-NEUTRAL EXTRACTABLE NONPRIORITY POLLUTANT	IT CORP(C) 9-10/84 (PPB)
ACETONE	620	ANILINE	40
2-BUTANONE	100,500	BENZOIC	460
CARBON DISULFIDE	50	BENZYL ALCOHOL	29,40
2-HEXANONE	23,000	4-CHLORANILINE	5.2,40
4-METHYL-2-PENTANONE	7,700	DIBENZOFURAN	40
STYRENE	1,100	2-METHYLNAPHTH-ALENE	2.1,40
VINYL ACETATE	50	2-METHYLPHENOL	180
O-XYLENE	9,200	4-METHYLPHENOL	100
TOTAL XYLENES	3,500	2-,3-,4-NITROAN-ILINES	40 EACH
		2,4,5-TRICHLORO-PHENOL	40

ATTACHMENT A (CONTINUED)

GROUND WATER CHARACTERISTICS OF LIPARI LANDFILL SAMPLES

METAL CONTAMINANT	RADIAN(A) 1983 (PPM)	JRB(C) 9/26/83 (PPM)	IT CORP(C) 9-10/84 (PPM)	CD(E,F) 3/85 (PPM)
ANTIMONY	.005	.20/.21J	.001	0.01G
ARSENIC	.003	.074/.087J	.016	0.002G
BARIUM	NR	NA	NA	.40
BERYLLIUM	.0005	.05	.001	0.01G
CADMIUM	.0005	.023/.068J	.011	.006
CHROMIUM	.001	5.1/51.0J	.050	0.02
COPPER	.062	.15/.20J	.25	0.01G
IRON	86	NA	NA	NA
LEAD	.003	.12/.92J	.01	.06
MANGANESE	.20	NA	NA	NA
MERCURY	.0002	.013	.0042	.001G
NICKEL	.004	.30/.70J	.05	.07
SELENIUM	.003	.21	.006	0.01G
SILVER	.002	.026/.080J	.003	0.01G
THALLIUM	.003	.27	.001	0.002G
ZINC	.071	1.2/1.3J	3.96	.14
CYANIDE	NR	.02	NA	4.95
PHENOIS	NR	18.4	NA	NA

ATTACHMENT A (CONTINUED)

GROUND WATER CHARACTERISTICS OF LIPARI LANDFILL SAMPLES

CONVENTIONAL PARAMETER	IT CORP(C) 9-10/84	DUPONT(E) 3/85	CDM(E,F) 3/85
	(PPM)	(PPM)	(PPM)
DISSOLVED ORGANIC CARBON	NA	863	NA
PH	NA	6.3	6.3
TOTAL SUSPENDED SOLIDS	NA	70	532(K)
BIOCHEMICAL OXYGEN DEMAND	NA	NA	1,319
CHEMICAL OXYGEN DEMAND	NA	NA	2,820
AMMONIA-NITROGEN	NA	NA	55.55
TOTAL KJELDAHL MITROGEN	NA	NA	57.65
PHOSPHOROUS	NA	NA	NA
PHOSPHATE	NA	NA	1,536
TOTAL DISSOLVED SOLIDS	NA	NA	164
TOTAL VOLATILE SUSPENDED SOLIDS	NA	NA	490
CONDUCTIVITY	NA	NA	1,900 UMHO/CM
OIL AND GREASE	4.8	NA	7.7
TOTAL ORGANIC CARBON	240	NA	NA
CHLORIDES	NA	NA	318.2
NITRATES	NA	NA	0.03
ALKALINITY	NA	NA	327
HARDNESS AS CACO(3)	NA	NA	188

(A) LABORATORY COMPOSITE OF SAMPLES FROM MONITORING WELLS C-C10A, AND C-4A.
(B) COMPOSITE OF SAMPLE DRUMS UPON RECEIPT AT LABORATORY.
(C) HIGHEST VALUE (WORST CASE) IS INDICATED.
(D) LIMITED SAMPLING DONE BY JRB ASSOCIATES FROM DECEMBER 10,1984, TO APRIL 15, 1985. THERE WERE FOUR SAMPLING EVENTS PERFORMED DURING THIS PERIOD.
(E) COLLECTED FROM PRODUCTION WELL PW-1 AT CONCLUSION OF 24-HOUR PUMP TEST.
(F) FIELD MEASUREMENTS PERFORMED BY CAMP DRESSER & MCKEE, INC., IN MARCH OF 1985 INDICATED LEACHATE TEMPERATURES RANGING FROM 10 TO 16 CENTIGRADE.
(G) ELEMENT IS LESS THAN VALUE GIVEN AND NOT DETECTED BY THE TECHNIQUE EMPLOYED. REPORT WITH DETECTION LIMIT.
(H) DUE TO THE HIGH INTERFERENCE LEVELS ENCOUNTERED, AN UNUSALLY HIGH DETECTION LIMIT EXISTS. AN UNDETERMINABLE AMOUNT OF RESULTS MAY BE DUE TO 1,2-DICHLOROETHANE.
(I) BELOW METHOD DETECTION LIMIT. QUANTITATION AND/OR IDENTIFICATION MAY BE UNCERTAIN AT THIS LEVEL.
(J) HIGHEST VALUE REPRESENTS THE MAXIMUM CONCENTRATION FOUND IN SHALLOW DRIVEN WELLS OUTSIDE OF CONTAIMENT SYSTEM.
(K) MAY BE LOW DUE TO EXTENDED HOLDING TIME OF SAMPLE.

NOTES: NR NOT REPORTED; NA NOT ANALYZED; ND NOT DETECTED

ATTACHMENT B

SUMMARY TABLES FOR OFF-SITE LIPARI
SAMPLING PROGRAMS

ONSITE SOILS - BASELINE SOIL SAMPLING RESULTS CDM 1987

	AVERAGE (UG/KG)	MAXIMUM (UG/KG)
SEMIVOLATILES		
PHENOL	10,938	130,000
BIS(2-CHLOROETHYL)ETHER	12,241	310,000
2-CHLOROPHENOL	19,550	36,000
1,3-DICHLOROBENZENE	220	220
1,4-DICHLOROBENZENE	1,116	2,200
BENZYL ALCOHOL	2,994	29,000
1,2-DICHLOROBENZENE	16,884	130,000
2-METHYL PHENOL	498	4,300
BIS(2-CHLOROISOPROPYL)ETHER	460	460
4-METHYLPHENOL	722	3,400
N-NITROSE-DIPROPYLAMINE	723	1,400
ISOPHORONE	9,276	130,000
2,4-DICHLOROPHENOL	157	1,100
BENZOIC ACID	5,209	19,000
2,4-DICHLOROPHENOL	7,408	46,000
1,2,4-TRICHLOROBENZENE	918	2,900
NAPHTHALENE	7,437	53,000
4-CHLOROANILINE	2,000	2,000
4-CHLORO-3-METHLYLPHENOL	6,000	6,000
2-METHYLNAPHTHALENE	2,726	16,000
2,4,6-TRICHLOROPHENOL	370	370
2-CHLORONAPHTHALENE	3,185	12,000
DIMETHYL PHTHALATE	687	1,200
ACCENAPHTHLENE	112	220
2,4-DICHLOROPHENOL	7,408	46,000
4-NITROPHENOL	9,035	18,000
DIBENZOFURAN	250	250
2,4-DINITROTOLUENE	2,800	2,800
DIETHYL PHTHALATE	866	4,300
FLOURENE	140	220
N-NITROSO-DIPHENYLAMINE	14,885	23,000
PENTACHLOROPHENOL	2,033	4,000
PHENANTHRENE	577	1,400
ANTHRACENE	48	55
DI-N-BUTYL PHTHALATE	1,734	6,800
FLOURANTHENE	369	500
PYRENE	267	460
BUTYL BENZYL PHTHALATE	1,059	7,200
BENZO(A)ANTHRACENE	213	340
CHRYSENE	169	360
BIS(2-ETHYLHEXYL)PHTHALATE	29,290	470,000
DI-N-OCTYL PHTHALATE	1,632	5,100
BENZO(B)FLOURANTHENE	475	700
BENZO(K)FLOURANTHENE	475	700
BENZO(A)PYRENE	126	240

ONSITE SOILS - BASELINE SOIL SAMPLING RESULTS CDM 1987 (CONTINUED)

	AVERAGE (UG/KG)	MAXIMUM (UG/KG)
VOLATILES		
ACETONE	5,914	43,000
METHYLENE CHLORIDE	3,500	20,000
CARBON DISULFIDE	220	1,300
TRANS-1,2-DICHLOROETHENE	9	9
CHLOROFORM	94	1,800
1,2-DICHLOROETHANE	25,816	320,000
2-BUTANONE	75	240
1,1,1-TRICHLOROETHANE	1,603	6,400
1,2-DICHLOROPROPANE	2	3
TRICHLOROETHENE	5,840	35,000
BENZENE	7,657	50,000
2-HEXANONE	51	76
4-METHYL-2-PENTANONE	2,577	73,000
1,1,2-TRICHLOROETHANE	2	2
TETRACHLOROETHENE	25,595	270,000
TOLUENE	260,011	3,200,000
CHLOROBENZENE	1,847	16,000
ETHYLBENZENE	64,408	1,200,000
STYRENE	169,897	2,300,000
TOTAL XYLENES	269,534	5,400,000
2-CHLOROETHYL VINYL ETHER	21,000	21,000

ONSITE SOILS - BASELINE SOIL SAMPLING RESULTS CDM 1987 (CONTINUED)

	AVERAGE (MG/KG)	MAXIMUM (MG/KG)		AVERAGE (MG/KG)	MAXIMUM (MG/KG)
INORGANICS			PESTICIDES		
ANTIMONY	7.5	11	AROCLOR 1248	9,788	11,750
ARSENIC	3.5	30	4,4-DDT	57	170
BARIUM	10.5	35	4,4-DDD	569	2,400
BERYLLIUM	0.7	1.6	4,4-DDE	3,395	31,000
CADMIUM	1.3	50	DIELDRIN	110	110
CHROMIUM	21.6	251	ELDRIN	180	180
COBALT	3.4	13	HEPTACHLOR	16	27
COPPER	20	763			
LEAD	6.9	56			
MERCURY	0.2	1.4			
NICKEL	4.2	19			
SILVER	1	1			
VANADIUM	15.2	94			
ZINC	28.9	278			

SUMMARY OF AIR SAMPLING PROGRAMS*

COMPOUND	NJIT 1979 LEA	HART(A) 1980 LEA	NJDEP		WESTON-TAT(B) 1985		
			LEA		VENTS		LAKE
			Z-1	Z-2	Z-3		
ACETONE					1.0		
BENZENE	DC				1.1	20	
BCEE					0.44		
C3ALKYL BENZENE				0.1	0.2	0.1	0.1
C6ALKANE					0.25		
C7ALKANE					1.2		
C8ALKANE						1.1	1.1
CHLOROFORM						D	
CHLOROETHANE						0.69	
1 ,1-DCA						10J	
1,2-DCA					0.29	30J	
1,1-DCE						10	
DICHLOROMETHANE					0.12	88	
1,4-DIOXANE					0.01		
ETHYL BENZENE					0.45	1.8	0.085
NAPTHALENE				0.12		2.0	
PHENOL			0.04	0.06			
PCE					2.5	12	
1,1,1-TCA			1.6	1.2	2.7	1.0	0.18
1,1,2-TCA					0.67		
TCE	D			0.16	D	2.0	0.16
TOLUENE	D				2.5	20	0.58
XYLENES	D				1.04	7.2	0.38
TOC		40PPM					

-ALL CONCENTRATIONS ARE IN PPM-

* THIS SUMMARY TABLE INCLUDES AIR-MONITORING PROGRAMS PREFORMED PRIOR TO THE TAGA PROGRAM.

A FRED C. HART (1980) SAMPLES WERE ANALYSED FOR TOC ALONE.

B WESTON-TAT (1985) SAMPLES WERE IN CONJUNCTION WITH THE OFF-SITE REMEDIAL INVESTIGATION PERFORMED BY CDM.

C "D" FLAG INDICATES THAT A COMPOUND WAS DETECTED BUT NOT QUATIFIED. "J" INDICATES AN ESTIMATED CONCENTRATION.

LEA INDICATES AIR SAMPLES TAKEN ABOVE LEACHATE SEEPS IN THE CHESTNUT BRANCH MARSH.

VENT INDICATES AIR SAMPLES TAKEN AT THE ON-SITE PASSIVE GAS VENTS

LAKE INDICATES AIR SAMPLES TAKEN ABOVE ALCYON LAKE.

SUMMARY OF TAGA RESIDENTIAL AIR MONOTORING PROGRAM

COMPOUND	LOCATION & SEASON *								
	HAWARD AVENUE			HOLLY/CEDAR			LAKESIDE		
	1	2	3	1	2	3	1	2	3
ACETONE	66	43	369	165	89	53J	21J	72	81
BENZENE	5J	4J	25	20J	3J	-	-	4J	8J
BCEE	-	3J	-	-	-	-	-	-	-
C3ALKYL BENZENES	15J	-	-	-	-	-	-	-	-
1,1-DCA	6J	180	4J	-	3J	-	-	6J	4J
1,2-DCA	-	5	10J	-	1J	-	-	-	-
1,1-DCE	-	2J	6J	-	-	-	-	-	-
DICHLOROMETHANE	-	37	45J	-	12J	-	-	30J	17J
1,4-DIOXANE	-	5J	-	-	6J	-	-	6J	-
ETHYL BENZENE	-	9J	7J	-	13J	-	-	8J	-
FREON-12	-	-	14J	-	-	-	-	-	4J
ISOPROPYL BENZENE	-	10J	-	-	-	-	-	5J	-
MLK	-	6J	-	-	8J	-	-	5J	-
METHYLENE CHLORIDE	-	-	-	-	-	-	-	-	-
1,1,1-TCA	-	2J	7J	-	1J	-	-	1J	-
1,1,2-TCA	-	9J	31J	-	-	-	-	-	-
TCE	-	7J	39J	-	-	-	-	7J	-
TOLUENE	9J	8J	26	-	7J	-	-	18	8J

SUMMARY OF TAGA RESIDENTIAL AIR MONOTORING PROGRAM(CONTINUED)

COMPOUND	LOCATION & SEASON *					
	NEIGHBORHOOD			SPILLWAY		
	1	2	3	1	2	3
ACETONE	33J	17	39J	12J	27	36J
BENZENE	-	-	8J	-	-	-
BCEE	-	-	-	-	-	-
C3ALKYL BENZENES	14J	-	-	-	-	-
1,1-DCA	4J	4J	-	-	3J	-
1,2-DCA	-	-	-	-	1J	-
1,1-DCE	-	-	2J	-	-	-
DICHLOROMETHA	-	22J	-	-	12J	-
1,4-DIOXANE	-	-	-	-	3J	-
ETHYL BENZENE	23J	-	14J	-	-	-
FREON-12	-	-	-	-	-	-
ISOPROPYL BENZENE	-	-	-	-	6J	-
MLK	-	4J	-	-	12J	-
METHYLENE CHLORIDE	24J	-	-	-	-	-
1,1,1-TCA	-	1J	18	-	-	-
1,1,2-TCA	-	-	6J	-	-	-
TCE	-	-	-	-	-	-
TOLUENE	10J	-	16J	-	-	-

* SEASONS: 1-SPRING; SAMPLING PERFORMED DURING MAY AND JUNE,1986.
2-SUMMER; SAMPLING PERFORMED DURING SEPTEMBER,1986.
3-FALL; SAMPLING PERFORMED DURING OCTOBER AND NOVEMBER 1987.

"J" COMPOUNDS FLAGGED WITH A "J" INDICATES THAT THE COMPOUND WAS DETECTED. A VALUE THAT IS BETWEEN THE INSTRUMENT DETECTION LIMIT AND QUANTITATION LIMIT WILL BE FLAGGED WITH A "J", INDICATING AN ESTIMATE VALUE.

ATTACHMENT B (CONTINUED)

WELLS WITHIN CONTAINMENT SYSTEM

SAMPLE LOC	K-2	K-2	K-3	K-3
SAMPLE #	13-1186	23	13-1187	24
CONTRACTOR	WWC	JRB	WWC	JRB
DATE SAMPLED	11-16-81	8-12-83	11-16-83	8-12-83
UNITS	PPB	PPB	PPB	PPB
COMPOUNDS				
VOLATILES				
ACETONE	2700	10		
BENZENE		7		30
BROMODICHLOROMETHANE				47
BROMOFORM				
CARBON DISULFIDE				
CHLOROBENZENE				
CHLOROETHANE				
CHLOROFORM				86
DICHLOROETHANE,1,1-				
DICHLOROETHANE, 1,2-	250	5500		88
DICHLOROETHYLENE,TRANS-1,2-				
DICHLOROPPOPANE,1,2-				
DICHLOROPROPENE,1,3-				
ETHYLBENZENE				
KETONES	30600			
METHYL4-,-2-PENTANONE				
METHYLENE CHLORIDE	140	390	60	100
STYRENE				
TETRACHLOPOETHENE				
TOLUENE		4	40	51
TRICHLOROETHANE,1,1,1-				
TRICHLOROETHANE,1,1,2-				
TRICHLOROETHYLENE				
VINYL CHLORIDE				
VINYLIDENE CHLORIDE				
XYLENES(TOTAL				

SEMIVOLATILES

ACENAPHTYLENE				
ANTHRACENE				
BENZO(A)PYRENE				
BIS(-2-CHLORDETHOXY)ETHANE	6100	8500	1430	8500
BIS(-2-CHLORODETHOXY)METHANE				
BIS(-2-CHLORDOETHYL)ETHER	3400	7400	640	4400
BIS(2-ETHYLHEXYL)PHTHALATE				
BUTYLBENZYLPHTALATE				
CUMENE				
SI-N-BUTYLPHTHALATE				
DI-N-BETYL PHTHALATE				
DICHLOROBENZENE,1,2-				
DICHLOROBENZENE,1,4-				
DIETHYLPGTHALATE				
FLUORANTHENE				
FLUORENE				
METHYLPHENOL,4-				
MAPTHALENE				
PHENANTHRENE				
PHENOL		350		57
PYRENE				
TRICHLOROPHENOL,2,4,6-				

ATTACHMENT B (CONTINUED)

WELLS WITHIN CONTAINMENT SYSTEM

SAMPLE LOC	C-15	C-17	C-3	C-19
SAMPLE #	7	5		2
CONTRACTOR	JRB	JRB	WWC	JRB
DATE SAMPLED	8-10-83	8-10-83	6-16-81	8-12-83
UNITS	PPB	PPB	PPB	PPB
COMPOUNDS				
VOLATILES				
ACETONE				
BENZENE		790	2290	4400
BROMODICHLOROMETHANE				280
BROMOFORM				
CARBON DISULFIDE				
CHLOROBENZENE				73
CHLOROETHANE		24		47
CHLOROFORM		610		760
DICHLOROETHANE,1,1-			230	650
DICHLOROETHANE, 1,2-		480	30200	
DICHLOROETHYLENE,TRANS-1,2-				43
DICHLOROPPOPANE,1,2-				
DICHLOROPROPENE,1,3-				
ETHYLBENZENE		630	810	4400
KETONES				
METHYL4-,-2-PENTANONE				
METHYLENE CHLORIDE		1400	32400	39000
STYRENE				
TETRACHLOPOETHENE				
TOLUENE	2	3200		73000
TRICHLOROETHANE,1,1,1-				73
TRICHLOROETHANE,1,1,2-				
TRICHLOROETHYLENE				
VINYL CHLORIDE				
VINYLIDENE CHLORIDE				76
XYLENES(TOTAL)			4600	

SEMIVOLATILES

ACENAPHTYLENE				
ANTHRACENE				
BENZO(A)PYRENE				
BIS(-2-CHLORDETHOXY)ETHANE		62000	42600	100000
BIS(-2-CHLORODETHOXY)METHANE		75000	34000	83000
BIS(-2-CHLORDOETHYL)ETHER				
BIS(2-ETHYLHEXYL)PHTHALATE				
BUTYLBENZYLPHTALATE				
CUMENE				
SI-N-BUTYLPHTHALATE				
DI-N-BETYL PHTHALATE				
DICHLOROBENZENE,1,2-				370
DICHLOROBENZENE,1,4-				
DIETHYLPHTHALATE		85		350
FLUORANTHENE				
FLUORENE				
METHYLPHENOL,4-				
MAPTHALENE	10			140
PHENANTHRENE				
PHENOL		12000	13900	12000
PYRENE				
TRICHLOROPHENOL,2,4,6-				

ATTACHMENT B (CONTINUED)

WELLS WITHIN CONTAINMENT SYSTEM

SAMPLE LOC	C-10A	C-10A	C-6A	C-6A	C-23
SAMPLE #		35		39	16
CONTRACTOR	WWC	JRB	WWC	JRB	JRB
DATE SAMPLED	6-16-81	8-10-83	6-16-81	8-12-83	8-10-83
UNITS	PPB	PPB	PPB		
COMPOUNDS					
VOLATILES					
ACETONE					
BENZENE		78	13000	4200	1800
BROMODICHLOROMETHANE					
BROMOFORM					
CARBON DISULFIDE					
CHLOROBENZENE				270	20
CHLOROETHANE					4
CHLOROFORM				21	
DICHLOROETHANE,1,1-			200	77	40
DICHLOROETHANE, 1,2-	50	74	33800	5500	2000
DICHLOROETHYLENE,TRANS-1,2-			60	45	79
DICHLOROPPOPANE,1,2-					
DICHLOROPROPENE,1,3-					7
ETHYLBENZENE		69	5720	2600	860
KETONES					
METHYL4-,-2-PENTANONE					
METHYLENE CHLORIDE	60	36	14600	950	450
STYRENE					
TETRACHLOPOETHENE			190		30
TOLUENE		18	67900	43000	8800
TRICHLOROETHANE,1,1,1-					
TRICHLOROETHANE,1,1,2-					
TRICHLOROETHYLENE					14
VINYL CHLORIDE					
VINYLIDENE CHLORIDE					2
XYLENES(TOTAL)			21830		

SEMIVOLATILES					
ACENAPHTYLENE					
ANTHRACENE					
BENZO(A)PYRENE					
BIS(-2-CHLORDETHOXY)-ETHANE	37700	11000	27600	7600	5100
BIS(-2-CHLORODETHOXY)-METHANE					
BIS(-2-CHLORDOETHYL)-ETHER	18300	5700	14100	6500	3500
BIS(2-ETHYLHEXYL)PHTHALATE					
BUTYLBENZYLPHTALATE			300		
CUMENE					
SI-N-BUTYLPHTHALATE					
DI-N-BETYL PHTHALATE					
DICHLOROBENZENE,1,2-					
DICHLOROBENZENE,1,4-					100
DIETHYLPHTHALATE				54	17
FLUORANTHENE					
FLUORENE					
METHYLPHENOL,4-					
MAPTHALENE					47
PHENANTHRENE					
PHENOL			5800	4500	1700
PYRENE					
TRICHLOROPHENOL,2,4,6-					

ATTACHMENT B (CONTINUED)

DOWNERADIENT WELLS

SAMPLE LOC	C-18	C-18	CP-1	CP-8
SAMPLE #	1		34	BB531
CONTRACTOR	JRB	JRB	JRB	CDM
DATE SAMPLED	8-10-83	12-10-84	8-12-83	5-23-85
UNITS	PPB	PPB	PPB	PPB
COMPOUNDS				
VOLATILES				
ACETONE				
BENZENE	2200	1600	2400	
BROMODICHLOROMETHANE	300		94	
BROMOFORM				
CARBON DISULFIDE				
CHLOROBENZENE	45		78	
CHLOROETHANE				
CHLOROFORM	720		190	660
DICHLOROETHANE,1,1-	760		180	990
DICHLOROETHANE, 1,2-	4500		2000	8500
DICHLOROETHYLENE,TRANS-1,2-	300		45	
DICHLOROPPOPANE,1,2-	24			
DICHLOROPROPENE,1,3-				
ETHYLBENZENE	2400		1700	
KETONES				
METHYL4-,-2-PENTANONE				8300
METHYLENE CHLORIDE	5000		350	
STYRENE				
TETRACHLOPOETHENE				
TOLUENE	35000	26000	36000	1300
TRICHLOROETHANE,1,1,1-				
TRICHLOROETHANE,1,1,2-				
TRICHLOROETHYLENE			21	
VINYL CHLORIDE	96			
VINYLIDENE CHLORIDE				
XYLENES(TOTAL				

SEMIVOLATILES

ACENAPHTYLENE			
ANTHRACENE			
BENZO(A)PYRENE			
BIS(-2-CHLORDETHOXY)ETHANE	140000	5700	58000
BIS(-2-CHLORODETHOXY)METHANE			
BIS(-2-CHLORDOETHYL)ETHER	58000	8900	27000
BIS(2-ETHYLHEXYL)PHTHALATE			65
BUTYLBENZYLPHTALATE			
CUMENE			
SI-N-BUTYLPHTHALATE	44		
DI-N-BETYL PHTHALATE			
DICHLOROBENZENE,1,2-	64		
DICHLOROBENZENE,1,4-			
DIETHYLPGTHALATE	210		71
FLUORANTHENE			
FLUORENE			
METHYLPHENOL,4-			
MAPTHALENE	210		
PHENANTHRENE			
PHENOL	5300		2000
PYRENE			
TRICHLOROPHENOL,2,4,6-			

ATTACHMENT B (CONTINUED)

DOWNERADIENT WELLS

SAMPLE LOC	C-27	C-27/SOIL	C-29	C-31
SAMPLE #	BB541	BA931	BB528	BB529
CONTRACTOR	CDM	CDM	CDM	CDM
DATE SAMPLED	5-29-85	5-20-85	5-22-85	5-23-85
UNITS	PPB	PPB	PPB	PPB
COMPOUNDS				
VOLATILES				
ACETONE				
BENZENE			1000	
BROMODICHLOROMETHANE				
BROMOFORM				20
CARBON DISULFIDE				
CHLOROBENZENE				
CHLOROETHANE				
CHLOROFORM				
DICHLOROETHANE,1,1-				
DICHLOROETHANE, 1,2-	38			
DICHLOROETHYLENE,TRANS-1,2-				
DICHLOROPPOPANE,1,2-				
DICHLOROPROPENE,1,3-				
ETHYLBENZENE				20
KETONES				
METHYL4-,-2-PENTANONE			8800	60
METHYLENE CHLORIDE				
STYRENE				20
TETRACHLOPOETHENE				20
TOLUENE				
TRICHLOROETHANE,1,1,1-				
TRICHLOROETHANE,1,1,2-				30
TRICHLOROETHYLENE				
VINYL CHLORIDE				
VINYLIDENE CHLORIDE				
XYLENES(TOTAL				

SEMIVOLATILES

ACENAPHTYLENE		
ANTHRACENE		
BENZO(A)PYRENE		
BIS(-2-CHLORDETHOXY)ETHANE		
BIS(-2-CHLORODETHOXY)METHANE		
BIS(-2-CHLORDOETHYL)ETHER		
BIS(2-ETHYLHEXYL)PHTHALATE	2100	
BUTYLBENZYLPHTALATE		2400
CUMENE		
SI-N-BUTYLPHTHALATE		
DI-N-BETYL PHTHALATE		2200
DICHLOROBENZENE,1,2-		
DICHLOROBENZENE,1,4-		
DIETHYLPGTHALATE		
FLUORANTHENE		
FLUORENE		
METHYLPHENOL,4-		
MAPTHALENE		
PHENANTHRENE		
PHENOL		
PYRENE		
TRICHLOROPHENOL,2,4,6-		

ATTACHMENT B (CONTINUED)

	DOWNERADIENT WELLS					
SAMPLE LOC	CP-2	CP-2	CP-7	C-4A	C-22	C-22
SAMPLE #	33		BB532		18	
CONTRACTOR	JRB	JRB	CDM	WWC	JRB	JRB
DATE SAMPLED	8-12-83	12-10-84	5-31-85	6-16-81	8-10-83	12-10-84
UNITS	PPB	PPB	PPB	PPB	PPB	PPB
COMPOUNDS						
VOLATILES						
ACETONE						
BENZENE	2400	2800		3700	1100	250
BROMODICHLOROMETHANE						
BROMOFORM						
CARBON DISULFIDE						
CHLOROBENZENE	21					
CHLOROETHANE						
CHLOROFORM	164				72	
DICHLOROETHANE,1,1-	78			780	62	
DICHLOROETHANE, 1,2-		5500		11500	65	
DICHLOROETHYLENE,TRANS-1,2-				200	200	
DICHLOROPPOPANE,1,2-						
DICHLOROPROPENE,1,3-						
ETHYLBENZENE	1100			1770	2200	
KETONES						
METHYL4-,-2-PENTANONE						
METHYLENE CHLORIDE	12000	14000		11300		
STYRENE						
TETRACHLOPOETHENE						
TOLUENE	75000			47800	19000	1100
TRICHLOROETHANE,1,1,1-						
TRICHLOROETHANE,1,1,2-						
TRICHLOROETHYLENE						
VINYL CHLORIDE						
VINYLIDENE CHLORIDE						
XYLENES(TOTAL)				7260		

SEMIVOLATILES

ACENAPHTYLENE						
ANTHRACENE						
BENZO(A)PYRENE						
BIS(-2-CHLORDETHOXY) ETHANE	140000	61000		152000	47000	4100
BIS(-2-CHLORODETHOXY) METHANE						
BIS(-2-CHLORDOETHYL) ETHER	75000	240000	290	88700	26000	7700
BIS(2-ETHYLHEXYL) PHTHALATE	14					
BUTYLBENZYLPHTALATE						
CUMENE						
DI-N-BUTYLPHTHALATE			20			
DI-N-BETYL PHTHALATE						
DICHLOROBENZENE,1,2-	27		80		72	
DICHLOROBENZENE,1,4-						
DIETHYLPGTHALATE	30		20		41	
FLUORANTHENE						
FLUORENE						
METHYLPHENOL,4-						
MAPTHALENE					34	
PHENANTHRENE						
PHENOL	22000	21000		10100	38	
PYRENE						
TRICHLOROPHENOL,2,4,6-			60			

ATTACHMENT B (CONTINUED)

	DOWNERADIENT WELLS			
SAMPLE LOC	C-11	C-11	C-24	CP-3
SAMPLE #		36	15	32
CONTRACTOR	WWC	JRB	JRB	JRB
DATE SAMPLED	6-16-81	8-12-83	8-12-83	8-12-83
UNITS	PPB	PPB	PPB	PPB
COMPOUNDS				
VOLATILES				
ACETONE				
BENZENE	280	450	350	1700
BROMODICHLOROMETHANE				97
BROMOFORM				
CARBON DISULFIDE				
CHLOROBENZENE				
CHLOROETHANE				
CHLOROFORM			43	240
DICHLOROETHANE,1,1-	2090		70	120
DICHLOROETHANE, 1,2-			32	300
DICHLOROETHYLENE,TRANS-1,2-			58	230
DICHLOROPPOPANE,1,2-				
DICHLOROPROPENE,1,3-				
ETHYLBENZENE		450	1400	660
KETONES				
METHYL4-,-2-PENTANONE				
METHYLENE CHLORIDE			140	93
STYRENE				
TETRACHLOPOETHENE				
TOLUENE	370	630	400	6200
TRICHLOROETHANE,1,1,1-				
TRICHLOROETHANE,1,1,2-				
TRICHLOROETHYLENE				
VINYL CHLORIDE				
VINYLIDENE CHLORIDE				
XYLENES(TOTAL)	110			

SEMIVOLATILES			
ACENAPHTYLENE			
ANTHRACENE			
BENZO(A)PYRENE			
BIS(-2-CHLORDETHOXY) ETHANE	38000	13000	16000
BIS(-2-CHLORODETHOXY) METHANE			
BIS(-2-CHLORDOETHYL) ETHER	4900	13000	9000
BIS(2-ETHYLHEXYL) PHTHALATE			
BUTYLBENZYLPHTALATE			
CUMENE			
DI-N-BUTYLPHTHALATE			
DI-N-BETYL PHTHALATE			
DICHLOROBENZENE,1,2-			4
DICHLOROBENZENE,1,4-		190	
DIETHYLPGTHALATE		62	14
FLUORANTHENE			
FLUORENE			
METHYLPHENOL,4- MAPTHALENE		89	8
PHENANTHRENE			
PHENOL	62		260
PYRENE			
TRICHLOROPHENOL,2,4,6-			

ATTACHMENT B (CONTINUED)

		DOWNERADIENT WELLS		
SAMPLE LOC	CP-3	C-7	C-7
SAMPLE #			37
CONTRACTOR	JRB	WWC	JRB
DATE SAMPLED	12-10-84	6-16-81	8-12-83
UNITS	PPB	PPB	PPB
COMPOUNDS			
VOLATILES			
ACETONE			
BENZENE	6900	690	5900
BROMODICHLOROMETHANE			
BROMOFORM			
CARBON DISULFIDE			
CHLOROBENZENE			
CHLOROETHANE			
CHLOROFORM			200
DICHLOROETHANE,1,1-		400	150
DICHLOROETHANE, 1,2-	58	7350	2200
DICHLOROETHYLENE,TRANS-1,2-		120	85
DICHLOROPPOPANE,1,2-			
DICHLOROPROPENE,1,3-			
ETHYLBENZENE		1180	1700
KETONES			
METHYL4-,-2-PENTANONE			
METHYLENE CHLORIDE	900	4470	1100
STYRENE			
TETRACHLOPOETHENE			
TOLUENE	850	33300	48000
TRICHLOROETHANE,1,1,1-			
TRICHLOROETHANE,1,1,2-			
TRICHLOROETHYLENE			
VINYL CHLORIDE			
VINYLIDENE CHLORIDE			
XYLENES(TOTAL)		4200	

SEMIVOLATILES			
ACENAPHTYLENE			
ANTHRACENE			
BENZO(A)PYRENE			
BIS(-2-CHLORDETHOXY) ETHANE	2700	54500	37000
BIS(-2-CHLORODETHOXY) METHANE			
BIS(-2-CHLORDOETHYL) ETHER	6900	23000	20000
BIS(2-ETHYLHEXYL) PHTHALATE			
BUTYLBENZYLPHTALATE			
CUMENE			
DI-N-BUTYLPHTHALATE			
DI-N-BETYL PHTHALATE			
DICHLOROBENZENE,1,2-			
DICHLOROBENZENE,1,4-			
DIETHYLPGTHALATE			27
FLUORANTHENE			
FLUORENE			
METHYLPHENOL,4-			
MAPTHALENE			
PHENANTHRENE			
PHENOL	790	13400	7500
PYRENE			
TRICHLOROPHENOL,2,4,6-			

ATTACHMENT C
QUALITATIVE SUMMARY OF COMPOUNDS DETECTED IN THE ON-SITE LIPARI LANDFILL AND IN OFF-SITE AREAS
QUALITATIVE SUMMARY OF COMPOUNDS DETECTED ON-SITE & OFF-SITE LIPARI AREAS

VOLATILES	ON-SITE		OFF-SITE					
	COHANSEY		CNSY	KWOOD	MARSH			
COMPOUND	SOIL	WAT	WAT	WAT	SOIL	LEA	AIR	
CHLOROMETHANE						X		
BROMOMETHANE								
VINYL CHLORIDE		X	X			X		
CHLOROETHANE		X				X		
METHYLENE CHLORIDE		X	X	X	X	X		
ACETONE	X	X		X	X	X	X	
CARBON DISULFIDE	X				X	X		
1,1-DICHLOROETHENE						X	X	
1,1-DICHLOROETHANE		X	X	X	X	X	X	
1,2-DICHLOROETHENE	X	X	X	X	X	X		
CHLOROFORM	X	X	X	X		X		
1,2-DICHLOROETHANE	X	X	X	X		X	X	
2-BUTANONE	X	X		X		X		
1,1,1-TRICHLOROETHANE	X	X		X			X	
CARBON TETRACHLORIDE						X	X	
VINYL ACETATE								
BROMODICHLOROMETHANE		X	X	X				
1,2-DICHLOROPROPENE	X		X					
CIS-1,3-DICHLOROPROPENE		X						
TRICHLOROETHENE	X	X			X	X	X	
DIBROMOCHLOROMETHANE								
1,1,2-TRICHLOROETHANE	X		X				X	
BENZENE	X	X	X	X	X	X	X	
TRANS-1,3-TRICHLOROETHANE								
BROMOFORM			X					
4-METHYL-2PENTANONE	X	X	X	X	X	X		
2-HEXANONE	X	X				X	X	
TETRACHLOROETHENE	X	X	X		X			
1,1,2,2-TERTRACHLOROETHENE								
TOLUENE	X	X	X	X	X	X	X	
CHLOROBENZENE	X	X	X		X	X	X	
ETHYLBENZENE	X	X	X	X	X	X	X	
STYRENE	X	X	X				X	
XYLENES	X	X	X	X	X	X	X	
2-CHLOROETHYL VINYL ETHER	X							
C3ALKYL BENZENE							X	
C6ALKANE							X	
C7ALKANE							X	
C8ALKANE							X	
FREON-12								
1,4-DIOXANE							X	

KEY:

CNSY - COHANSEY AQUIFER
KWOOD-KIRKWOOD AQUIFER
MARSH-CHESTNUT BRANCH MARSH
R RUN-RABBIT RUN
ALCYON-ALCYON LAKE
CHNT BR-CHESTNUT BRANCH STREAM
WAT-WATER SAMPLE
LEA-LEACHATE SAMPLE
AIR-AIR SAMPLE

QUALITATIVE SUMMARY OF COMPOUNDS DETECTED ON-SITE & OFF-SITE LIPARI AREAS

VOLATILES

COMPOUND	CHNT BR SED	CHNT BR WAT	R RUN SED	R RUN WAT	ALCYON SED	ALCYON WAT	ALCYON AIR	RESIDENTIAL AIR
CHLOROMETHANE	X					X		
BROMOMETHANE								
VINYL CHLORIDE								
CHLOROETHANE				X				
METHYLENE CHLORIDE	X	X	X	X	X	X		X
ACETONE	X	X	X	X	X	X	X	X
CARBON DISULFIDE					X			
1,1-DICHLOROETHENE								X
1,1-DICHLOROETHANE				X				X
1,2-DICHLOROETHENE								
CHLOROFORM								
1,2-DICHLOROETHANE								X
2-BUTANONE	X	X		X	X			
1,1,1-TRICHLOROETHANE	X	X	X			X	X	X
CARBON TETRACHLORIDE								
VINYL ACETATE								
BROMODICHLOROMETHANE								
1,2-DICHLOROPROPENE								
CIS-1,3-DICHLOROPROPENE								
TRICHLOROETHENE		X					X	X
DIBROMOCHLOROMETHANE								
1,1,2-TRICHLOROETHANE								X
BENZENE	X	X	X	X	X	X		X
TRANS-1,3-TRICHLOROETHANE						X		
BROMOFORM								
4-METHYL-2PENTANONE					X			
2-HEXANONE							X	X
TETRACHLOROETHENE								
1,1,2,2-TERTRACHLOROETHENE								
TOLUENE	X	X	X	X	X	X	X	X
CHLOROBENZENE								
ETHYLBENZENE	X			X			X	X
STYRENE				X				
XYLENES	X						X	X
2-CHLOROETHYL VINYL ETHER								
C3ALKYL BENZENE							X	X
C6ALKANE								
C7ALKANE								
C8ALKANE							X	
FREON-12								
1,4-DIOXANE								X

KEY:

CNSY - COHANSEY AQUIFER
KWOOD-KIRKWOOD AQUIFER
MARSH-CHESTNUT BRANCH MARSH
R RUN-RABBIT RUN
ALCYON-ALCYON LAKE
CHNT BR-CHESTNUT BRANCH STREAM
WAT-WATER SAMPLE
LEA-LEACHATE SAMPLE
AIR-AIR SAMPLE

QUALITATIVE SUMMARY OF COMPOUNDS DETECTED ON-SITE & OFF-SITE LIPARI AREAS

SEMI-VOLATILES	ON-SITE COHANSEY		OFF-SITE CNSY	KWOOD	MARSH		
COMPOUND	SOIL	WAT	WAT	WAT	SOIL	LEA	AIR
PHENOL	X	X	X	X		X	X
BIS (2-CHLOROETHYL)ETHER	X	X	X	X	X	X	X
2-CHLOROPHENOL	X						
1,3-DICHLOROBENZENE	X				X		
1,4-DICHLOROBENZENE	X	X	X				
BENZYL ALCOHOL	X	X				X	
1,2-DICHLOROBENZENE	X	X	X		X	X	
2-METHYL PHENOL	X	X				X	
BIS (2-CHLOROISOPROPYL)ETHER	X						
4-METHYL PHENOL	X	X				X	
N-NITROSO-DI-N-PROPYLAMINE	X						
HEXACHLOROETHANE							
NITROBENZENE							
ISOPHORONE	X				X	X	
2-NITROPHENOL							
2,4-DIMETYYL PHENOL	X				X		
BENZOIC ACID	X	X			X	X	
BIS (2-CHLOROETHOXY)ETHANE		X	X	X	X	X	
2,4-DICHLOROPHENOL		X					
1,2,4-TRICHLOROBENZENE	X						
NAPHTHALENE	X	X	X		X	X	X
4-CHLOROANILINE	X	X				X	
HEXACHLOROBUTADIENE							
4-CHLORO-3-METHYL PHENOL	X						
2-METHYL NAPHTHALENE	X	X			X	X	
HEXACHLOROCYCLOPENTADIENE							
2,4,6-TRICHLOROPHENOL	X			X			
2,4,5-TRICHLOROPHENOL							
2-CHLORONAPHTHALENE	X						
2-NITROANALINE							
DIMETHYL PHTHALATE	X						
ACENAPHTHALENE	X	X			X		
3-NITROANALINE							
ACENAPHTHENE					X		
2,4-DINITROPHENOL	X						
4-NITROPHENOL	X						
DIBENZOFURAN	X				X		
2,4-DINITROTOLUENE	X						
2,6-DINITROTOLUENE							
DIETHYL PHTHALATE	X	X	X			X	
4-CHLOROPHENYL-PHENYLETHER							
FLOURENE	X				X		
4-NITROANILINE							
4,6-DINITRO-2-METHYLPHENOL							
N-NITROSODIPHENYLAMINE	X				X		
4-BROMOPHENYL-PHENYLETHER							
HEXZCHLOROBENZENE		X			X		
PENTACHLOROPHENOL	X						
PHENANTHRENE	X				X		
ANTHRACENE	X						

QUALITATIVE SUMMARY OF COMPOUNDS DETECTED ON-SITE & OFF-SITE LIPARI AREAS

SEMI-VOLATILES

COMPOUND	CHNT SED	BR WAT	R RUN SED	WAT	ALCYON SED	WAT	AIR	RESIDENTIAL AIR
PHENOL				X		X		
BIS (2-CHLOROETHYL)ETHER	X	X	X	X	X	X		X
2-CHLOROPHENOL								
1,3-DICHLOROBENZENE								
1,4-DICHLOROBENZENE								
BENZYL ALCOHOL								
1,2-DICHLOROBENZENE								
2-METHYL PHENOL					X			
BIS (2-CHLOROISOPROPYL) ETHER								
4-METHYL PHENOL			X		X			
N-NITROSO-DI-N-PROPYLAMINE								
HEXACHLOROETHANE								
NITROBENZENE								
ISOPHORONE								
2-NITROPHENOL								
2,4-DIMETYYL PHENOL		X						
BENZOIC ACID	X	X	X	X				
BIS (2-CHLOROETHOXY)ETHANE		X	X	X		X		
2,4-DICHLOROPHENOL								
1,2,4-TRICHLOROBENZENE								
NAPHTHALENE	X		X	X	X			
4-CHLOROANILINE								
HEXACHLOROBUTADIENE								
4-CHLORO-3-METHYL PHENOL								
2-METHYL NAPHTHALENE	X							
HEXACHLOROCYCLOPENTADIENE								
2,4,6-TRICHLOROPHENOL								
2,4,5-TRICHLOROPHENOL								
2-CHLORONAPHTHALENE								
2-NITROANALINE								
DIMETHYL PHTHALATE								
ACENAPHTHALENE								
3-NITROANALINE								
ACENAPHTHENE	X	X	X		X			
2,4-DINITROPHENOL								
4-NITROPHENOL			X					
DIBENZOFURAN								
2,4-DINITROTOLUENE								
2,6-DINITROTOLUENE								
DIETHYL PHTHALATE	X		X					
4-CHLOROPHENYL-PHENYLETHER								
FLOURENE			X		X			
4-NITROANILINE								
4,6-DINITRO-2-METHYLPHENOL								
N-NITROSODIPHENYLAMINE			X					
4-BROMOPHENYL-PHENYLETHER								
HEXZCHLOROBENZENE								
PENTACHLOROPHENOL								
PHENANTHRENE	X		X		X			
ANTHRACENE	X		X		X			

QUALITATIVE SUMMARY OF COMPOUNDS DETECTED ON-SITE & OFF-SITE LIPARI AREAS

SEMI-VOLATILES	ON-SITE		OFFF-SITE				
	COHANSEY		CNSY	KWOOD	MARSH		
COMPOUND	SOIL	WAT	WAT	WAT	SOIL	LEA	AIR
DI-N-BUTYL PHTHALATE	X	X	X		X	X	
FLOURANTHENE	X				X	X	
PYRENE	X				X	X	
BUTYLBENZYL PHTHALATE	X	X		X			
3,3'-DICHLOROBENZENE							
BENZO(A)ANTHRACENE	X				X		
BIS(2-ETHYLHEXYL)PHTHALATE	X		X	X	X	X	
CHRYSENE	X				X		
DI-N-OCTYL PHTHALATE	X			X	X	X	
BENZO(B)FLOURANTHENE	X				X		
BENZO(K)FLOURANTHENE	X				X		
BENZO(A)PYRENE	X	X					
INDENO(1,2,3-CD)PYRENE					X		
DIBENZO(A,H)ANTHRACENE							
BENZO(G,H,I)PERYLENE					X		
INORGANIC							
ARSENIC	X	X	X	X	X	X	
BARIUM	X	X	X	X	X		
BERYLLIUM	X		X	X		X	
CADMIUM	X	X	X	X	X	X	
CHROMIUM	X	X	X	X	X	X	
COPPER	X	X	X	X	X	X	
LEAD	X	X	X	X	X	X	
MERCURY	X	X	X	X	X	X	
NICKEL	X	X	X	X	X	X	
SELENIUM		X	X	X			
SILVER	X	X	X	X		X	
THALIUM			X	X			
VANADIUM	X	X	X	X	X	X	
ZINC	X	X	X	X	X	X	

QUALITATIVE SUMMARY OF COMPOUNDS DETECTED ON-SITE & OFF-SITE LIPARI AREAS

SEMI-VOLATILES

	CHNT BR		R RUN		ALCYON		RESIDENTIAL
COMPOUND	SED	WAT	SED	WAT	SED	WAT AIR	AIR
DI-N-BUTYL PHTHALATE	X	X	X	X	X	X	
FLOURANTHENE	X	X	X		X		
PYRENE	X		X		X		
BUTYLBENZYL PHTHALATE	X			X			
3,3'-DICHLOROBENZENE							
BENZO(A)ANTHRACENE	X		X		X		
BIS(2-ETHYLHEXYL)PHTHALATE	X	X	X	X	X	X	
CHRYSENE	X	X	X		X		
DI-N-OCTYL PHTHALATE	X				X		
BENZO(B)FLOURANTHENE	X				X		
BENZO(K)FLOURANTHENE	X				X		
BENZO(A)PYRENE	X		X		X		
INDENO(1,2,3-CD)PYRENE	X				X		
DIBENZO(A,H)ANTHRACENE					X		
BENZO(G,H,I)PERYLENE	X				X		
INORGANIC							
ARSENIC	X			X	X	X	
BARIUM	X	X		X	X	X	
BERYLLIUM	X		X	X	X	X	
CADMIUM	X	X	X	X	X	X	
CHROMIUM	X	X	X	X	X	X	
COPPER	X	X	X	X	X	X	
LEAD	X	X	X	X	X	X	
MERCURY	X		X	X	X	X	
NICKEL	X	X	X	X	X	X	
SELENIUM	X	X		X	X	X	
SILVER		X		X	X	X	
THALIUM	X						
VANADIUM	X	X	X	X	X	X	
ZINC	X	X	X	X	X	X	

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION
SITE: LIPARI LANDFILL SITE, PITMAN, NEW JERSEY

ANALYSIS REVIEWED: I HAVE REVIEWED THE FOLLOWING DOCUMENTS DESCRIBING THE ANALYSIS OF COST-EFFECTIVENESS OF REMEDIAL ALTERNATIVE AT THE LIPARI LANDFILL SITE:

- DRAFT COST-EFFECTIVENESS ASSESSMENT OF REMEDIAL ACTION ALTERNATIVES,LIPARI LANDFILL, RADIAN CORPORATION, JULY 1982
- DRAFT ENVIRONMENTAL INFORMATION DOCUMENT FOR REMEDIAL
- ACTIONS AT THE LIPARI LANDFILL, PITMAN, NEW JERSEY, RADIAN CORPORATION, JULY 1982
- PRELIMINARY ENGINEERING STUDY, LIPARI LANDFILL, PITMAN, NEW JERSEY, BETZ, CONVERSE, MURDOCH, INC., MAY 1982
- ABATEMENT ALTERNATIVES - UNCONTROLLED CHEMICAL LEACHATE DISCHARGE FROM THE LIPARI LANDFILL, PITMAN, NEW JERSEY, R.E. WRIGHT ASSOCIATES, INC. OCTOBER 1980 REVISED DECEMBER 1980
- TECHNICAL CONSIDERATIONS FOR THE SELECTION OF AN ABATEMENT SYSTEM AT THE LIPARI LANDFILL, PITMAN, NEW JERSEY, R.E. WRIGHT ASSOCIATES, SEPTEMBER 1981
- STAFF SUMMARIES AND RECOMMENDATIONS

DESCRIPTION OF SELECTED OPTION:

- PHASE I:

EMPLACEMENT OF A 360 DEGREE CUTOFF WALL WITH CAP OVER 16 ACRES (ENCLOSED AREA WOULD INCLUDE THE SIX ACRE LANDFILL AND THE 10 ACRE CONTAMINATED ARE BETWEEN THE LANDFILL AND CHESTNUT BRANCH).

- PHASE II:

INSTALLATION OF GROUND WATER COLLECTION WELLS (LOCATED BOTH WITHIN THE CONTAMINATED ZONE AND WASTE BODY ITSELF) TREATMENT OF THE GROUND WATER CONTAINED WITHIN THE SLURRY WALL.

DECLARATIONS: CONSISTENT WITH THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT OF 1980 (CERCLA), AND THE NATIONAL CONTINGENCY PLAN, I HAVE DETERMINED THAT THE CONTAINMENT AND TREATMENT STRATEGY FOR THE LIPARI LANDFILL SITE IS A COST-EFFECTIVE REMEDY, AND THAT IT EFFECTIVELY MITIGATES AND MINIMIZES DAMAGE TO, AND PROVIDES ADEQUATE PROTECTION OF PUBLIC HEALTH, WELFARE AND THE ENVIRONMENT. I HAVE ALSO DETERMINED THAT THE ACTION BEING TAKEN IS APPROPRIATE WHEN BALANCED AGAINST THE NEED TO USE TRUST FUND MONEY AT OTHER SITES.

THE COLLECTION AND TREATMENT OF THE CONTAINED CONTAMINATED GROUND WATER IS DESIRABLE IN ORDER TO IMPROVE THE RELIABILITY OF THE CONTAINMENT. THE ASSOCIATED COSTS ARE BASED UPON UTILIZATION OF A LOCAL PUBLICLY OWNED TREATMENT WORKS (POTW) WITHOUT SIGNIFICANT PRETREATMENT. THE PROPER EVALUATION OF THE TREATMENT SYSTEM IS BEING CONDUCTED BY A CONSULTANT TO THE U.S. ENVIRONMENTAL PROTECTION AGENCY (USEPA). I HAVE DETERMINED THAT IT IS NECESSARY TO PROCEED WITH THE INSTALLATION OF THE SLURRY WALL AND CAP CONCURRENT WITH THE FINAL TREATABILITY EVALUATION OF THE LEACHATE WITH THE EXISTING TREATMENT PROCESS AT THE POTW. I WILL MAKE A FUTURE DECISION ON THE NECESSARY GROUNDWATER PRETREATMENT PROCESS AFTER COMPLETION OF THE TECHNICAL ANALYSIS AND EVALUATION WHICH WILL DETERMINE THE COMPATIBILITY OF THE LEACHATE WITH THE EXISTING TREATMENT PROCESSES OF THE LOCAL POTW.

RITA M. LAVELLE
ASSISTANT ADMINISTRATOR
OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE

LIPARI LANDFILL REMEDY APPROVAL
BRIEFING SHEET

PURPOSE OF THIS BRIEFING IS TO OBTAIN AA APPROVAL FOR THE REMEDY RECOMMENDED BY THE REGION AND THE STATE FOR THE LIPARI LANDFILL SITE. A "RECORD OF DECISION" HAS BEEN PREPARED TO DOCUMENT THE APPROVAL.

LIPARI LANDFILL OCCUPIES APPROXIMATELY SIX ACRES. BETWEEN THE PERIOD 1958 AND 1971, THE LANDFILL RECEIVED HOUSEHOLD WASTE AS WELL AS LIQUID AND SEMI-SOLID CHEMICAL WASTES AND OTHER INDUSTRIAL WASTES AND MATERIALS FOR DISPOSAL. BEST ESTIMATES INDICATE APPROXIMATELY 3 MILLION GALLONS OF LIQUID WASTES HAVE BEEN DISPOSED AT THE SITE.

GROUNDWATER AND SURFACE WATER CONTAMINATION IS THE PRIMARY CONCERN AT LIPARI LANDFILL. RABBIT RUN, CHESTNUT BRANCH AND ALCYON LAKE ARE SHOWN TO BE CONTAMINATED. STRONG VOLATILE CHEMICAL ODORS ARE EVIDENT AT THE ON-SITE LEACHATE SEEPS.

IN MARCH 1980, A FEASIBILITY STUDY WAS INITIATED BY R.E. WRIGHT ASSOCIATES THROUGH CLEAN WATER ACT, SECTION 311 FUNDING. R.E. WRIGHT ASSOCIATES COMPLETED A SECOND REPORT IN SEPTEMBER 1981 WHEREIN THE PREVIOUS CONCLUSION WAS REVISED, AND A TWO PHASE APPROACH WAS RECOMMENDED.

PHASE I: SLURRY WALL CONTAINMENT WITH CAP

PHASE II: FURTHER EVALUATION TO COLLECT AND TREAT ENCAPSULATED CONTENTS.

EPA HELD A PUBLIC MEETING IN NOVEMBER 1981 WHEREIN THE AGENCY MADE AN ANNOUNCEMENT OF THE CONSULTANT'S RECOMMENDATIONS, EPA'? REGION II CONCURRENCE AND POSSIBLE SCHEDULE FCR CONSTRUCTION INITIATION BY SPRING OF 1982.

IN JANUARY 1982, THE CONSULTANT TO THE RESPONSIBLE PARTIES (BETZ, CONVERSE AND MURDOCH), SUBMITTED A NEW ALTERNATIVE CLEAN-UP PLAN TO THE EPA PROPOSAL. EPA REGION II, EPA/ORD, AND RADIAN, INC. SUBSEQUENTLY INITIATED A COST-EFFECTIVE ANALYSIS OF ALTERNATIVES, INCLUDING THE RESPONSIBLE PARTY'S ALTERNATIVE AND THE PREPARATION OF AN ENVIRONMENTAL INFORMATION DOCUMENT TO COMPLY WITH CERCLA REQUIREMENTS.

THE RADIAN CORPORATION COMPLETED THEIR COST-EFFECTIVENESS EVALUATION ON REMEDIAL ALTERNATIVES STUDIED PREVIOUSLY BY R.E. WRIGHT, 1980; 1981; AND BETZ, CONVERSE AND MURDOCH 1982 AS WELL AS A NO ACTION ALTERNATIVE. NINE ALTERNATIVES WERE INITIALLY CONSIDERED HIGHLY/COST-EFFECTIVE AND WERE EVALUATED FURTHER IN THE ENVIRONMENTAL INFORMATION DOCUMENT (JULY 1982):

	MILLION $
360 DEGREES CUTOFF WALL WITH CAP (16 ACRES) /COLLECT WITH WALLS/TREAT AT POTW	2.0
UPGRADIENT DEFLECTION WALL WITH CAP (6 ACRES)	1.2
UPGRADIENT DEFLECTION WALL WITH CAP (6 ACRES)/ COLLECT WITH WELLS/TREAT AT POTW	1.7
360 DEGREES CUTOFF WALL WITH CAP (6 ACRES)	1.0
360 DEGREES CUTOFF WALL WITH CAP (16 ACRES)	1.5
360 DEGREES CUTOFF WALL WITH CAP (6 ACRES)/ COLLECT WITH WELLS/TREAT AT POTW	1.4
COLLECT WITH WELLS/TREAT AT POTW	0.4
DEFLECTION WALL/UPGRADIENT DRAIN/CAP (22 ACRES)	2.1

DEFLECTION WALL/UPGRADIENT DRAIN/CAP (22 ACRES)/ COLLECT WITH WELLS/TREAT AT POTW	2.5

FURTHER EVALUATION OF THESE ALTERNATIVES BY EPA STAFF AT BOTH THE REGION AND HEADQUARTERS LEVEL, WITH TECHNICAL ASSISTANCE PROVIDED BY THE ZONE CONTRACTOR (CAMP, DRESSER, & MCKEE) AND INFORMATION CONTAINED IN THE ENVIRONMENTAL INFORMATION DOCUMENT, HAS LED TO THE FURTHER ELIMINATION OF ALTERNATIVES AS ENVIRONMENTALLY UNACCEPTABLE EXCEPT FOR THE FOLLOWING THREE:

	MILLION
360 DEGREES CUTOFF WALL WITH CAP (16 ACRES)/ COLLECT WITH WELLS/TREAT AT POTW	2.0
360 DEGREES CUTOFF WALL WITH CAP (16 ACRES)	1.5
DEFLECTION WALL/UPGRADIENT DRAIN/CAP 22 ACRES/ COLLECT WITH WELLS/TREAT AT POTW	2.5

THIS HAS LED TO THE SELECTION OF ONE ALT+RNATIVE AS THE MOST COST-EFFECTIVE, ENVIRONMENTALLY SOUND REMEDIAL ACTION. IT IS: THE 360 DEGREES CUTOFF WALL WITH CAP (16 ACRES).

THE RECOMMENDED ALTERNATIVE ACTION, HOWEVER, INCLUDES IN ADDITION TO THE ENCAPSULATION OF THE 16 ACRE SITE, ACTIVE GROUNDWATER CONTROL THROUGH COLLECTION AND TREATMENT AT A LOCAL POTW TO ENHANCE THE RELIABILITY OF THE ENCAPSULATION. ADDITIONAL EVALUATION TO ASSURE THE COMPATIBILITY OF THE LEACHATE WITH THE EXISTING TREATMENT PROCESSES OF THE LOCAL POTW NEED TO BE CONDUCTED PRIOR TO PROCEEDING WITH THE SECOND PHASE (COLLECTION AND TREATMENT). THE TOTAL COST FOR DESIGN AND IMPLEMENTATION OF THE CUTOFF WALL AND CAP IN ADDITION TO FURTHER EVALUATION RELATED TO THE COLLECTION AND TREATMENT OF LEACHATE HAS BEEN ESTIMATED AT $1,769,150.

ANOTHER PUBLIC MEETING WAS HELD ON JULY 23, 1982. THE REGION DESCRIBED THE REMEDY AND ADDRESSED CONCERNS RAISED BY THE PUBLIC.

THE "RECORD OF DECISION" CERTIFIES THAT:

THE SELECTED REMEDY IS THE COST-EFFECTIVE REMEDY FOR THE SITE.

OFF-SITE DISPOSAL OF THE LEACHATE IS UNDER INVESTIGATION AS A COST-EFFECTIVE APPROACH FOR THAT PORTION OF THE PROJECT.

MONIES ARE AVAILABLE IN THE FUND TO FINANCE THE REMEDY. THE FOLLOWING ACTIONS ARE REQUIRED TO MOVE THE PROJECT INTO CONSTRUCTION:

- PREPARE RECORD OF DECISION	REGION
- BEGIN DESIGN PHASE PREPARATION OF BID PACKAGE AND SAFETY PLAN FOR WALL CONSTRUCTION COMPLETE TREATABILITY STUDY	HSCD/REGION
- PREPARE ACTION MEMO (FOR CONSTRUCTION)	HSCD
- APPROVE ACTION MEMO	AA, OAWER
- PREPARE STATE SUPERFUND CONTRACT	REGION/STATE
- SIGN STATE SUPERFUND CONTRACT	AA, OSWER/STATE
- PREPARE IAG WITH CORPS	HSCD
- COMPLETE AND AWARD CONSTRUCTION CONTRACT	CORPS
- BEGIN CONSTRUCTION	CORPS

REMEDIAL IMPLEMENTATION ALTERNATIVE SELECTION
LIPARI LANDFILL SUPERFUND SITE

TOWNSHIP OF MANTUA
GLOUCESTER COUNTY, NEW JERSEY
JULY 30, 1982

HISTORY

THE LIPARI LANDFILL OCCUPIES APPROXIMATELY SIX ACRES IN THE TOWNSHIP OF MANTUA, GLOUCESTER COUNTY, NEW JERSEY. A STREAM KNOWN AS CHESTNUT BRANCH FLOWS IN A NORTH-WESTERLY DIRECTION ALONG THE NORTHERN AND NORTHEASTERN BORDERS OF THE LANDFILL. ANOTHER STREAM, RABBIT RUN, FLOWS IN A NORTHWESTERLY DIRECTION AND BORDERS THE WESTERN AREA OF THE LANDFILL. RABBIT RUN ENTERS CHESTNUT BRANCH AT A POINT ON THE NORTHERN BORDER OF THE LANDFILL. CHESTNUT BRANCH FLOWS INTO ALCYON LAKE APPROXIMATELY 1000 FEET DOWNSTREAM FROM THE LANDFILL.

FOR 13 YEARS RUNNING FROM 1958 TO 1971, THE OWNER, MR. NICHOLAS LIPARI, BEGAN ACCEPTING AND DISPOSING OF WASTE AT THE LIPARI LANDFILL. THE LANDFILL HAS BEEN INACTIVE SINCE 1971, AND A PORTION HAS BEEN AND IS NOW USED FOR A FRUIT ORCHARD. THE TOP OF THE LANDFILL RISES APPROXIMATELY 40 FEET ABOVE THE CHESTNUT BRANCH. THE LAND SURFACE SLOPES FROM AN ELEVATION OF 134 MEAN SEA LEVEL ("MSL") DOWN TOWARDS BOTH RABBIT RUN AND CHESTNUT BRANCH WHERE THE ELEVATION OF THIS NORTHERN BORDER IS 120 FEET MSL.

OCCUPIED HOMES ARE LOCATED JUST ACROSS THE EDGE OF THE NORTHEASTERN BORDER OF THE LANDFILL SITE ON THE OPPOSITE SIDE OF CHESTNUT BRANCH.

DURING THE YEARS BETWEEN 1958 AND 1971, THE OWNER, MR. LIPARI, ACCEPTED AND DISPOSED OF HOUSEHOLD WASTE AS WELL AS LIQUID AND SEMI-SOLID CHEMICAL WASTES, AND OTHER INDUSTRIAL WASTES AND MATERIALS

THE HAZARDOUS WASTES DUMPED AT LIPARI LANDFILL WERE GENERATED BY ROHM AND HAAS COMPANY FROM ITS BRISTOL, PENNSYLVANIA PLANT; OWENS ILLINOIS, INC. FROM ITS PITMAN, NEW JERSEY PLANT AND OWENS-CORNING FIBERGLAS, INC. FROM ITS BARRINGTON, NEW JERSEY PLANT.

THE HAZARDOUS WASTES DUMPED AT THE LANDFILL BY THE GENERATORS AND HAULERS HAVE PERCOLATED INTO THE GROUNDWATERS UNDER THE LANDFILL. THE WASTES HAVE LEACHED OUT THE EMBANKMENTS OF RABBIT RUN AND CHESTNUT BRANCH FURTHER CONTAMINATING THE SURFACE WATERS WHICH RUN INTO THESE RESPECTIVE STREAMS. HAZARDOUS WASTES LEACHING FROM THE LANDFILL HAVE CONTAMINATED THE CHESTNUT BRANCH, RABBIT RUN AND ALCYON LAKE AND CONTINUE TO CONTAMINATE THESE BODIES OF WATER.

CURRENT STATUS

THE LIPARI LANDFILL HAS BEEN INACTIVE SINCE 1971. THE MAIN ROUTES FOR CONTAMINANT MIGRATION FROM THE LANDFILL ARE GROUND WATER AND SURFACE WATER. LEACHATE SEEPS ARE VISIBLE ALONG THE LANDFILL ESCRAPEMENT ADJACENT TO CHESTNUT BRANCH, EAST OF THE LANDFILL AREA AND ALONG RABBIT RUN. GROUND WATER AND SURFACE WATER CONTAMINATION HAS BEEN DOCUMENTED. THE PRESENCE OF BCCE IN FISH FROM ALCYON LAKE HAS ALSO BEEN REPORTED. LOCAL RESIDENTS HAVE COMPLAINED ABOUT THE PRESENCE OF ODORS THEY ATTRIBUTE TO THE LANDFILL.

THE COST-EFFECTIVENESS EVALUATION PREPARED BY RADIAN CORPORATION (JULY 1982) REVIEWED THE PREVIOUS FEASIBILITY STUDIES OF R.E. WRIGHT (1980, 1981) AND BETZ, CONVERSE AND MURDOCH (1982). RADIAN EVALUATED 32 POSSIBLE ALTERNATIVE REMEDIAL ACTIONS, OF WHICH 9 WERE DETERMINED TO BE HIGHLY COST-EFFECTIVE OPTIONS:

	ESTIMATED COST	
	CAPITAL	TOTAL 0&M
360 DEGREE CUTOFF WALL WITH CAP (16 ACRES)/ COLLECT WITH WELLS/TREAT AT POTW	1.8M	180K
UPGRADIENT DEFLECTION WALL WITH CAP (6 ACRES)	1.2M	---

UPGRADIENT DEFLECTION WALL WITH CAP (6 ACRES)/COLLECT WITH WELLS/ TREAT AT POTW	1.4M	273K
360 DEGREE CUTOFF WALL WITH CAP (6 ACRES)	985K	---
360 DEGREE CUTOFF WALL WITH CAP (16 ACRES)	1.5M	---
360 DEGREE CUTOFF WALL WITH CAP (6 ACRES)/ COLLECT WITH WELLS/TREAT AT POTW	1.2M	180K
COLLECT WITH WELLS/ TREAT AT POTW	210K	180K
DEFL+CTION WALL/UPGRADIENT DRAIN/ CAP (22 ACRES)	2.LM	---
DEFLECTION WALL/UPGRADIENT DRAIN/ CAP (22 ACRES)/COLLECT WITH WELLS/ TREAT AT POTW	2.3M	273K

AFTER GIVING CAREFUL CONSIDERATION TO THE COST-EFFECTIVENESS AND ENVIRONMENTAL ASSESSMENT OF EACH ALTERNATIVE AND EVALUATING COMMENTS WE HAVE RECEIVED, THE REGION RECOMMENDS THAT THE CONTAINMENT, ACTIVE GROUNDWATER CONTROL ALTERNATIVE BE IMPLEMENTED AT THE SITE (ATTACHMENT A). A LETTER FROM THE STATE OF NEW JERSEY CONCURRING WITH THE APPROACH IS ENCLOSED AS ATTACHMENT B.

CONSIDERATIONS LEADING TO THE NEED FOR COLLECTION AND TREATMENT OF THE ENCAPSULATED LEACHATE INCLUDE

1. UNDEFINED LONG TERM INTEGRITY OF THE SLURRY WALL.

2. COLLECTION OF THE LEACHATE CONTENTS WILL LOWER THE INTERNAL HEAD, MINIMIZING INFILTRATION THROUGH THE UNDERLYING CLAY AND THE POTENTIAL FOR CONTAMINATION OF THE KIRKWOOD AQUIFIER, A DRINKING WATER SUPPLY.

3. CURRENT COST ESTIMATES INDICATE THAT THE RELIABILITY OF THE ENCAPSULATION ACTION CAN BE ENHANCED AT A REASONABLE COST, THEREBY PROVIDING ADDITIONAL ASSURANCE FOR PROTECTION OF PUBLIC HEALTH AND THE ENVIRONMENT.

RECOMMENDED ALTERNATIVE

SECTION 300.68(J) OF THE NATIONAL CONTINGENCY PLAN (NCP) (FR 31180; JULY 16, 1982) STATES THAT THE APPROPRIATE EXTENT OF REMEDY SHALL BE DETERMINED BY THE LEAD AGENCY'S SELECTION OF THE REMEDIAL ALTERNATIVE WHICH THE AGENCY DETERMINATES IS COST-EFFECTIVE AND WHICH EFFECTIVELY MITIGATES AND MINIMIZES DAMAGE TO AND PROVIDES ADEQUATE PROTECTION OF PUBLIC HEALTH, WELFARE OR THE ENVIRONMENT. BASED ON OUR EVALUATION OF THE COAT-EFFECTIVENESS OF EACH OF THE PROPOSED ALTERNATIVES, THE COMMENTS RECEIVED FROM THE PUBLIC, OUR TECHNICAL CONSULTANTS, AND INFORMATION/COMMENTS FROM THE STATE, WE HAVE DETERMINED THAT THE TWO PHASE: PHASE I, 360 CUTOFF WALL WITH CAP (16 ACRES) ENCAPSULATION, IN CONJUNCTION WITH PHASE II, COLLECTION WELLS AND TREATMENT AT THE LOCAL POTW STRATEGY IDENTIFIED IN THE COST-EFFECTIVENESS REPORT MEETS THE NCP CRITERIA

THE ENCAPSULATION, COLLECTION AND TREATMENT OPTION ENTAILS THE SPECIFIC ACTIVITIES IDENTIFIED IN ATTACHMENT C. THE COST BREAK-DOWN FOR THIS REMEDIAL ALTERNATIVE IS LISTED BELOW.

ACTIVITY	ESTIMATED COSTS
PHASE I:	
PREPARATION OF DETAILED DESIGN	$ 100,000
CUTOFF WALL AND CAP CONSTRUCTION	$1,589,150

TREATMENT FEASIBLITY STUDY		80?000
	TOTAL	$1,769,150

PHASE II:

COLLECTION AND TREATMENT CONSTRUCTION	$	209,120
POTW DISPOSAL AND OPERATION AND MAINTENANCE	$	91,250 PER YEAR

PROPOSED ACTION

WE REQUEST YOUR APPROVAL OF THE ENCAPULATION, COLLECTION AND TREATMENT OPTION AS THE REMEDIAL ACTION ALTERNATIVE FOR LIPARI LANDFILL. IN ADDITION, WE REQUEST THE ALLOCATION OF $1,769,150 FOR THE PHASE I PROJECT ACTIVITIES AS INDICATED ABOVE WHICH INCLUDES ASSOCIATED ENGINEERING COSTS.

TENTATIVE SCHEDULE	1982
FINAL OPPORTUNITY FOR PRIVATE PARTY CLEAN-UP	MID AUGUST
STATE/EPA SIGN SUPERFUND STATE CONTRACT	LATE AUGUST
COMPLETE DESIGN OF SLURRY WALL AND CAP	OCTOBER
RECEIVE BIDS, AWARD CONTRACT, AND BEGIN CONSTRUCTION (PHASE I)	NOVEMBER
COMPLETE TREATABILITY STUDY (PHASE II)	DECEMBER

IF YOU.HAVE ANY QUESTIONS, PLEASE CONTACT ROBERT OGG AT (212) 264-2647.

ATTACHMENT A

REMEDIAL IMPLEMENTATION ALTERNATIVE SELECTION
LIPARI LANDFILL SUPERFUND SITE
TOWNSHIP OF MANTUA
GLOUCESTER COUNTY, NEW JERSEY

EPA HAS COMPLETED THE FOLLOWING REMEDIAL SUPERFUND ACTIVITIES AT THE LIPARI LANDFILL SITE LOCATED IN GLOUCESTER COUNTY, NEW JERSEY:

ACTIVITIES	DATE COMPLETED
REMEDIAL INVESTIGATION/ FEASIBILITY STUDY	OCTOBER 1980, DECEMBER 1980 REVISED
REMEDIAL INVESTIGATION/ FEASIBILITY STUDY	SEPTEMBER 1981
PUBLIC MEETING	NOVEMBER 1981
COST-EFFECTIVENESS ANALYSIS OF ALTERNATIVES	JULY 1982
FENCE ISOLATION OF THE SITE	JULY 1982
DRAFT ENVIRONMENTAL INFORMATION DOCUMENT	JULY 1982
PUBLIC MEETING	JULY 23, 1982

REGION II HAS REVIEWED THE INFORMATION PRESENTED IN EACH OF THESE REPORTS AND GIVEN CAREFUL CONSIDERATION TO THE COMMENTS RECEIVED FROM THE STATE OF NEW JERSEY, OUR TECHNICAL CONSULTANTS AND THE PUBLIC. BASED ON OUR REVIEW, REGION II HAS DETERMINED THAT THE FOLLOWING ACTIONS AT THE SITE ARE COST-EFFECTIVE, ENVIRONMENTALLY SOUND, AND EFFECTIVELY MITIGATE AND MINIMIZE DAMAGE TO AND PROVIDE ADEQUATE PROTECTION OF PUBLIC HEALTH, WELFARE OR THE ENVIRONMENT.

ACTION	ESTIMATED COST
PHASE I	
CONTAINMENT DESIGN	$ 100,000
WASTE CONTAINMENT CONSTRUCTION	$1,589,150
COLLECTION AND TREATMENT FEASIBILITY STUDY	$ 80,000
	$1,769,150

DATE

JACQUELINE E. SCHAFER
REGIONAL ADMINISTRATOR

ATTACHMENT B

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARD MANAGEMENT
OFFICE OF THE DIRECTOR

TRENTON, NEW JERSEY 04425

JULY 16, 1982

MR. ROBERT OGG
USEPA - REGION II
26 FEDERAL PLAZA
NEW YORK CITY, NEW YORK 10007

DEAR ROBERT:

AS YOU REQUESTED DURING YOUR JULY 15, 1982, MEETING WITH ANOHONY FARRO OF THIS DIVISION, WE HAVE REVIEWED YOUR GENERAL CONCEPT FOR THE FINAL REMEDIAN ACTION PLAN FOR THE LIPARI LANDFILL. ACCORDING TO YOUR REPRESENTATION TO MR. FARRO, EPA'S CONCEPTUAL PLAN INCLUDES:

1) THE CONSTRUCTION OF A 360 DEGREE CUTOFF WALL WITH CLAY CAP OVER 16 ACRES (THE ENCLOSED AREA WOULD INCLUDE THE SIX ACRE LANDFILL AND THE 10 ACRE CONTAMINATED AREA BETWEEN THE LANDFILL AND CHESTNUT BRANCH).

2) THE INSTALLATION OF GROUNDWATER COLLECTION WELLS (LOCATED BOTH WITHIN THE CONTAMINATED ZONE AND THE WASTE BODY ITSELF).

3) THE TRANSPORT OF CONTAMINATED GROUNDWATER, COLLECTED UNDER #2 ABOVE AFTER PRIMARY TREATMENT ON SITE IF NECESSARY, TO A PUBLIC OWNED TREATMENT WORKS (POTW) FOR FINAL TREATMENT AND DISCHARGE.

AFTER REQUESTING THE REVIEW OF THIS PLAN BY THE APPROPRIATE, INTERESTED DIVISIONS WITHIN THE DEPARTMENT, I CAN REPORT TO YOU THAT THE DEPARTMENT IS IN GENERAL AGREEMENT WITH THE CONCEPTUAL PLAN STATED ABOVE; PROVIDED, OF COURSE, THE POTW INVOLVED IS SATISFIED THAT IT HAS THE CAPACITY TO RECEIVE AND SATISFACTORILY TREAT, AS NECESSARY, THE CONTAMINATED GROUNDWATER TRANSPORTED TO IT UNDER ITEM #3 ABOVE. CONSEQUENTLY, IF WE FIND THAT THE POTW IS NOT A SATISFACTORY TREATMENT FACILITY FOR THE CONTAMINATED GROUNDWATER, ANOTHER TREATMENT METHOD WILL BE UTILIZED.

AS YOU KNOW, WE EXPECT TO EXECUTE A SUPERFUND AGREEMENT TO IMPLEMENT THIS REMEDIAL ACTION BY MID-AUGUST. RECENT DISCUSSIONS BETWEEN DEP AND EPA HAVE CONVINCED ME THAT THIS IS ALSO YOUR AGENCY'S INTENTION. I AM CONFIDENT THAT, WITH CONTINUED COOPERATION, WE CAN REFINE THIS CONCEPTUAL PLAN INTO A DETAILED REMEDIAL ACTION EXPEDITIOUSLY AND ACCOMPLISH OUR GOAL.

SINCERELY

JACK STANTON
DIRECTOR

EJS
CC: G. TYLER, ASST. COMMISSIONER
J. VERNAM
T. FARRO
D. MACK
G. KING

ATTACHMENT C

360 DEGREE CUTOFF WALL WITH CLAY CAP {SIXTEEN (16) ACRES}; COLLECT WITH WELLS; TREAT AT POTW

PHASE I

DEFLECTION/ENCAPS LATION SYSTEM

A 360 DEGREE CUTOFF WALL WITH CLAY CAP OVER THE LANDFILL AREA (6-ACRES) AND THE CONTAMINATED AREA (10-ACRAS) BETWEEN THE LANDFILL AND CHESTNUT BRANCH TO ISOLATE THE SOURCE OF LEACHATE AS PROPOSED IN THE WRIGHT REPORT (NOVEMBER 1980) INVOLVES:

! INSTALLATION OF AN IMPERMEABLE SLURRY WALL AROUND THE ENTIRE AFFECTED 16-ACRE AREA, AND

! INSTALLATION OF AN IMPERMEABLE CAP OVER THE 16-ACRE AREA.

360 DEGREE CUTOFF WALL OVER 16-ACRES AREA. A 360 SLURRY WALL AS SHOWN IN FIGURE 1 WILL COMPLETELY ISOLATE THE ENTIRE AREA (16-ACRES) FROM THE GROUNDWATER FLOW SYSTEM. THE CUTOFF WALL WOULD BE INSTALLED VERTICALLY FROM THE GROUND SURFACE DOWNWARD TO A LOCATION 2 TO 3 FEET INTO THE KIRKWOOD CLAY. IT WAS ESTIMATED THAT AN AVERAGE SLURRY WALL DEPTH OF 30 FEET WOULD BE REQUIRED THROUGHOUT MOST OF THE AFFECTED AREA, WITH AS MUCH AS 50 FEET IN DEPTH ALONG WESTERN PERIMETER OF THE DISPOSAL AREA. THE SLURRY TRENCH WOULD BE INSTALLED TO ACHIEVE A MAXIMUM PERMEABILITY OF 1.0 X 10-7 TO 1.0 X 10-8 CENTIMETERS PER SECOND.

BENTONITE CLAY CAP OVER THE LANDFILL. A BENTONITE CLAY CAP OVER THE ENTIRE AREA (16-ACRES) WILL MINIMIZE INFILTRATION OF RAINWATER INTO THE AREA. THE INSTALLATION OF A CAP WOULD INCLUDE REGRADING THE 16-ACRE AREA, DISKING BENTONITE SG-40 AT 1.5 LB/FT2, COMPACTION 12 INCHES COVER AND SEEDING.

PHASE II

COLLECTION SYSTEM

THE WELL DESIGN FOR THIS OPTION IS BASED ON THE FOLLOWING ASSUMPTION

! THE CUTOFF WALL AND CLAY CAP COMPLETELY ISOLATE THE SYSTEM FROM GROUND WATER AND SURFACE RECHARGE; AND

! THE CUTOFF WALL IS ABLE TO WITHSTAND A SIGNIFICANT GRADIENT BETWEEN THE GROUND-WATER SYSTEM AND THE ENCLOSED AREA, WHICH IS SUBJECT TO PUMPING.

THE WELL FIELD NEEDED TO REMOVE THE CONTAMINATED GROUND WATER FROM WITHIN THE 16 ACRE ENCLOSED AREA IS LOCATED THROUGHOUT THE WASTE AND PLUME AREAS.

TEN WELLS, SPACED AS SHOWN IN FIGURE 1 COULD THEORETICALLY REMOVE ALL OF THE ENCLOSED GROUND WATER WITHIN 1 YEAR. THIS ASSUMES A PUMPING RATE OF 10 GPM/WELL CONTINUOUSLY. SINCE THERE IS NO RECHARGE, HOWEVER, THE WELLS WILL DEWATER BEFORE THE ENTIRE VOLUME CAN BE PUMPED OUT. IT WILL BE NECESSARY, AT SOME POINT TO REDUCE THE PUMPING RATE AND MAINTAIN MAXIMUM YIELD. THE ABILITY TO REMOVE ALL CONTAMINATED FLUID AND THE ASSOCIATED PUMPING TIME NEEDED ARE EXPONENTIAL FUNCTIONS. IT WILL BE COST-EFFECTIVE TO REMOVE ONLY A PORTION OF THE TOTAL FLUID VOLUME, PERHAPS 80%. BASED ON THIS, THE FOLLOWING PUMPING RATES ARE SUGGESTED:

FIRST YEAR: ALL WELLS @ 10 GPM/WELL UNTIL DRAWDOWN IS NEAR MAXIMUM. (ESTIMATE 6-8 MONTHS)

REDUCE ALL WELLS AS NEEDED TO MAINTAIN MAXIMUM YIELD. (2-3 GPM OR LESS)

SECOND YEAR: CONTINUE PUMPING AT REDUCED RATES UNTIL A SATISFACTORY AMOUNT OF FLUID HAS BEEN REMOVED.

AT 10 GPM/WELL FOR 6 MONTHS AND 3 GPM/WELL FOR AN ADDITIONAL YEAR, APPROXIMATELY 86% OF THE CONTAMINATED

FLUID WOULD BE RECOVERED.

TREATMENT SYSTEMS

THE COLLECTED LEACHATE IS CURRENTLY PLANNED TO BE ROUTED TO THE GLOUCESTER COUNTY UTILITIES AUTHORITY (GCUA) WASTEWATER TREATMENT PLANT. THIS IS A 16.5 MGD MODIFIED CONTRACT STABILIZATION PLANT. AVERAGE FLOWS CURRENTLY RUN AT APPROXIMATELY 14-14.5 MGD WITH PEAK FLOWS OF 18-19 MGD (GCUA, MAY 18, 1981). THE PREDICTED LEACHATE PUMPING RATES ARE RELATIVELY LOW (28,000 - 144,000 GAL/DAY). THE HYDRAULIC CAPACITY OF THE PLANT AND THE COLLECTION SYSTEM ARE ADEQUATE FOR TREATMENT OF THE LEACHATE. THE MAIN TRUNK LINE IS DESIGNED FOR 24.1 MGD. IN ADDITION, GCUA IS PLANNING TO EXPAND PLANT CAPACITY IN THE NEAR FUTURE (GCUA, MAY 17, 1981). OPERATIONAL PARAMETARS AND PERFORMANCE DATA FOR THE GCUA ARE SUMMARIZED IN TABLE 3-6. A SEWER LINE TIE-IN ACROSS CHESTNUT BRANCH WOULD BE NECESSARY.

APPROXIMATELY 10-12% OF THE WASTEWATER FLOW AT GCUA IS FROM INDUSTRIAL CONTRIBUTION WITH 8% CONTRIBUTED BY SHELL CHEMICAL COMPANY (GCUA, MAY 18, 1981). PRELIMINARY CONTACTS WITH THE PLANT GENERAL MANAGER AND OPERATIONS MANAGER INDICATE THAT THE PLANT CAN HANDLE THIS WASTE STREAM; HOWEVER, GCUA WILL REQUIRE A CERTIFIED LABORATORY REPORT CHARACTERIZING THE LEACHATE AND WILL PERFORM THEIR OWN LABORATORY TESTS TO DETERMINE THE POTENTIAL EFFECTS OF THE WASTES ON THE PLANT.

THE PREDICTED PERFORMANCE OF THE GCUA PLANT IN TREATING LIPARI LEACHATE IS PRESENTED IN TABLE 3-7. INFLUENT CONCENTRATIONS ARE BASED ON COMBINING THE GCUA AVERAGE FLOW OF 14.5 MGD WITH THE PREDICTED HIGH LEACHATE PUMPING RATE. REMOVAL EFFICIENCIES WERE ESTIMATED FROM PLANT DATA FOR THE CONVENTIONAL POLLUTANTS AND A REVIEW OF THE LITERATURE FOR ORGANIC SPECIES. A FULL SCALE TREATABILITY STUDY IS CURRENTLY UNDERWAY TO ASSURE THE COMPATIBILITY OF THE LEACHATE TO THE TREATMENT SYSTEM.